ABCB

Rainwater Harvesting and Use

Research Report

PLUMBING CODE DEVELOPMENT RESEARCH PROJECT

RAINWATER HARVESTING AND USE

Research Report

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Published by: The Australian Building Codes Board
GPO Box 9839
CANBERRA ACT 2601
Phone: 1300 134 631
Email: ncc@abcb.gov.au
www.abcb.gov.au

First published: October 2016

Print version: 1.0
Release date: October 2016

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Preface

This report is the outcome of research and stakeholder consultation on the current requirements for rainwater harvesting and use nationally, conducted as part of the Australian Building Codes Board (ABCB) Plumbing Code Development Research Project.[1]

The purpose of this report is to document the issues identified through the research and stakeholder consultation processes and the ABCB's proposed responses, provided as recommendations.

[1] Australian Building Codes Board (ABCB). *Annual Business Plan 2014-15; 2015-16; 2016-17..*

Acknowledgements

The ABCB acknowledges the valuable contributions of the individuals and organisations who provided their input into the preliminary research for this report, as well as those who made submissions in response to the 2015 Consultation Paper.

The insight gained through these contributions has proved invaluable in the preparation of this report.

Executive summary

The uptake of rainwater harvesting by Australian households has significantly increased in recent years, encouraged at all levels of government through initiatives aimed at reducing reliance on reticulated drinking water supplies and better utilising this finite resource. However, rainwater harvesting and use is not currently managed in a nationally consistent manner and this could be considered detrimental to progress in promoting sustainable water use solutions at a local level.

This report, part of the Plumbing Code Development Research Project, draws together a disparate array of public policy, regulations and important technical publications, and makes recommendations designed to inform the development of an effective, national approach.

Recent Australian Bureau of Statistics (ABS) data indicates that the uptake of rainwater harvesting has increased markedly across most of Australia, and not entirely due to rebates. Approximately half of households surveyed by the ABS cited a desire to save water as a reason for installing a rainwater harvesting system, whereas only about 6% cited rebates. Perhaps unsurprisingly, uptake was highest in three states where rainwater harvesting is incorporated into the sustainability element of their building regulations — South Australia, Queensland and Victoria. In the future, uptake is expected to increase in response to changing and irregular weather patterns, which are resulting in decreasing rainfall in some areas (generally attributed to climate change) and the retention of most rainwater-related building regulations introduced during the last drought. There are also changes in public attitudes to water conservation.

Indeed, most of the jurisdiction-specific regulations identified by this report related to the implementation of rainwater harvesting to improve building sustainability rather than other aspects of the design or installation of these systems.

The *Rainwater Harvesting and Re-Use Consultation Paper* ('Consultation Paper'), and submissions received, focussed on three key areas: regulations; material/product standards and certification; and guidance documents, including the widely used Handbook HB 230.[2] Stakeholders were also asked to comment on the idea of a national approach. Responses were generally positive, although the importance of recognising local geographical and climatic differences was highlighted strongly by the rainwater harvesting industry.

A major concern for stakeholders was in relation to the Plumbing Code of Australia (PCA), which does not mention rainwater harvesting, despite its provisions being applicable to varying degrees in every State and Territory. This is causing uncertainty about whether rainwater can be considered drinking or non-drinking water and, accordingly, how to apply the appropriate requirements. Interestingly, it was noted in submissions that rainwater can fall into either category, and that the PCA should provide for both, rather than taking one side or the other; this position is

[2] HB 230: 2008 *Rainwater Tank Design and Installation Handbook,* jointly developed by Standards Australia, the National Water Commission and the Master Plumbers and Mechanical Services Association of Australia.

supported by the report. Other areas for clarification included the requirements for polyethylene tanks in bushfire-prone areas.

It should be noted that if rainwater harvesting is to be 'recognised' in the PCA, it will need to be identified how it would integrate with the water efficiency requirements of the code. That is, would the water efficiency requirements apply to rainwater as they would to water from a reticulated drinking water supply? Or, is the objective to simply better manage the amount of water drawn from the public supply, meaning that using rainwater is itself a solution to meeting the water efficiency requirements? The current situation is unclear, and high level direction would be required if the latter interpretation were to be adopted, as it may require the 'sustainability' component of the ABCB's role to be further clarified and possibly extended.

Some submissions also called for rainwater tanks to be included in the WaterMark Certification Scheme, and for existing requirements such as AS/NZS 4020[3] to be better enforced as a way of ensuring the quality and conformity of rainwater tanks in Australia. The significant increase in the size of the rainwater industry, competitive pressure, and evidence of non-conformity with current standards in recent times suggests a review may be warranted. However, at this stage it is considered appropriate that other changes recommended by this report first be given time to be assessed for their impact on compliance with material and product standards.

The third focus of the report was HB 230. The Consultation Paper suggested that this document was outdated in its description of administrative and regulatory requirements, but otherwise still valid in its technical content. However, stakeholders suggested that much of the technical content could also be reviewed and expanded upon, and that this would be very useful as the document is widely used and relied upon. In response, it is proposed that a new handbook be developed to include updated regulatory and technical content, and that this be produced as an ABCB document. This would enable it to be developed and maintained consistently with changes to the PCA and the WaterMark Certification Scheme, and be freely available online once completed.

Overall, it is considered that a national approach to rainwater harvesting and use can be achieved if the recommendations in this report are implemented. They would clarify the role of the existing national code — the PCA — as well as provide contemporary non-regulatory guidance. While that alone may not necessarily address the vast array of jurisdictional regulations currently in place, it will provide a clearer path to national consistency.

To support its conclusions, this report makes five recommendations which are set out on the next page.

[3] Standards Australia. *Australian Standard/New Zealand Standard 4020: Testing of products in contact with drinking water*. 2005. Compliance with this Standard is a requirement of the PCA (cl A2.1(d)).

Recommendations

Recommendation 1

That it be noted that a national approach to rainwater harvesting and use is generally supported by industry, that any work associated with this report be limited to rainwater harvesting and use only, and that further engagement be undertaken with the most affected industry sectors in the development of any future regulatory or guidance material.

Recommendation 2

That the PCA be amended to recognise rainwater harvesting and use under a new Part (i.e. 'Part B5'), and to consider the deletion of Deemed-to-Satisfy Provision B3.3.

Recommendation 3

That the text of Performance Requirement BP1.1 (and the identical BP2.1) be moved to the Deemed-to-Satisfy Provisions and replaced with new wording to the effect that the water supply to these installations must not pose an undue risk to the health of users. This clarifies the intent of the PCA requirement and that the most common (i.e. Deemed-to-Satisfy) way of meeting that intent is to connect the installation to the intended 'drinking water' supply, which may be rainwater.

Recommendation 4

That work be undertaken to clarify the requirements for rainwater tanks in bushfire-prone areas, particularly polyethylene tanks, so as to resolve the confusion between building, plumbing and fire authority requirements. This relates to rainwater tanks which are also used as water supplies for fire-fighting, as well as those used for ordinary drinking/non-drinking water supply.

Recommendation 5

That an ABCB non-mandatory handbook be developed to provide guidance on the current regulatory requirements and technical design considerations for rainwater harvesting systems. The content should be developed through detailed consultation with the Plumbing Code Committee and Building Codes Committee (BCC) where appropriate, and can be derived from the vast range of sources provided in this report. The new handbook would be intended to be made freely available by the ABCB.

1 Introduction

The uptake of rainwater harvesting by Australian households has significantly increased in recent years. This has been encouraged at all levels of government through initiatives aimed at reducing reliance on reticulated drinking water supplies and better utilising this finite resource. However, the increased uptake of rainwater systems has brought with it a complex range of regulations and guidelines.

Rainwater harvesting and use is not currently managed in a nationally consistent manner and this could be considered detrimental to progress in promoting sustainable water use solutions at a local level.

This report is part of the ABCB's Plumbing Code Development Research Project. It has identified multiple, potentially competing and definitely varying control measures between planning, building, plumbing, health and water authorities. These can appear quite confusing, especially when considered from a national perspective.

The overarching purpose of this report is to draw together this disparate array of public policy, regulations and important technical publications. The report makes recommendations designed to inform future deliberations on the development of an effective, national approach.

1.1 Rainwater harvesting and use in Australia

In Australia, site captured rainwater was used as a water supply prior to the installation of reticulated supplies in urban areas, and continues to be used in areas without reticulated water supplies. Historically, the capture and use of rainwater in areas with a reticulated supply was discouraged by governments, however this has changed in more recent times. Now, many State, Territory and Local Governments are allowing and offering rebates for the installation of rainwater tanks in these areas.[4]

However, rebates do not appear to be the major driver of rainwater tank installations nationally, compared to the desire to save water and/or comply with water restrictions. Only 5.4% of households surveyed cited rebates as a reason for installing their rainwater system, compared to 19.7% who cited water restrictions, and 49.4% who wanted to save water.[5] Approximately 2.5% of households installed a rainwater tank because they were not connected to a mains supply.[6]

[4] Productivity Commission. *Australia's Urban Water Sector,* Inquiry Report no.55: Volume 2. Canberra, August 2011. pp 97-8.

[5] Australian Bureau of Statistics. *Environmental issues: water use and conservation,* Cat. no. 4602.0.55.003, Table 12. Canberra, October 2013. In this survey, respondents were able to cite more than one reason for installing a rainwater tank. Therefore, the reasons cited are not mutually exclusive and so should not necessarily be considered 'primary' motivations.

[6] *Ibid*. This statistic should be considered a rough estimate only due to having a high relative standard error of between 25% and 50%.

The overall trend in uptake of rainwater harvesting increased from 19% to 26% over the period 2007-10, however it remained steady for the following three years reported, with approximately 2.3 million households using a rainwater tank as a source of water.[7] The highest proportions by State and Territory were South Australia (46%), Queensland (34%) and then Victoria (29%).[8]

According to a summary provided by the ABS on the use of rainwater:

> *Of those households that had a rainwater tank, over half (51%) had the tank connected to a tap or outlet inside the dwelling via water piping. This was more common for households living outside capital cities (67%) compared with those in capital cities (33%). Households in the Australian Capital Territory were the least likely to have their rainwater tank connected to an indoor tap or outlet (13%) compared with the other states and territories. Of those households residing in a state capital city, Hobart had the highest proportion of households with their rainwater tank connected to an indoor tap or outlet (82%).*[9]

What this indicates is a surge in the uptake of rainwater harvesting and use toward the end of the most recent drought period, which for most regions ended in 2010.[10] It is also interesting to note the wide variance in the proportion of households using rainwater for indoor uses, as these require a plumbing installation in the building itself, in addition to the installation of a rainwater system.

In the future, it is expected that the uptake of rainwater harvesting and use will only grow. There are several reasons for this. Firstly, it is likely that the need for alternative on-site water sources will increase as rainfall reduces, as is projected for southern parts of Australia.[11] Secondly, the two most populous states — New South Wales and Victoria — have building regulatory requirements which promote rainwater harvesting. Thirdly, in the urban water sector, changes in water pricing and public education and awareness since the most recent drought have brought about longer term changes in household water use patterns and attitudes toward conserving water.[12]

[7] *Ibid*. Table 2. See also: Australian Bureau of Statistics. Water Account Australia 2011-12: Feature Article 1 – Experimental estimates of household water consumption from rainwater tanks in Australia. Cat. no. 4160.10, Canberra, November 2013 (cited in the Consultation Paper to this Report).

[8] *Ibid*. These were followed by Tasmania (22%), New South Wales (19%), the Australian Capital Territory (15%), Western Australia (12%), and the Northern Territory (approx. 8%).

[9] *Ibid.* Summary – Rainwater Tanks (online): http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4602.0.55.003Main%20Features4Mar%202013?opendocument&tabname=Summary&prodno=4602.0.55.003&issue=Mar%202013&num=&view (accessed October 2015).The Summary refers to Table 11.

[10] Holper PN. *Australian Rainfall – Past, present and future,* Climate Change Science Information Paper, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Canberra. 2011. pp 2-3.

[11] *Ibid.* p 9.

[12] 'Water efficiency in Australia', in *Second independent review of the Water Efficiency Labelling and Standards Scheme,* Final Report, Commonwealth of Australia, 2015. pp 23-4.

Further detail on State and Territory policies specific to rainwater harvesting, and applicable building and plumbing legislation, is provided in the appendices to this report.

1.2 About the Australian Building Codes Board

The ABCB is a Council of Australian Governments (COAG) standards-writing body that is responsible for the National Construction Code (NCC). It is a joint initiative of all three levels of government in Australia and was established by an Intergovernmental Agreement (IGA) signed by the Commonwealth, States and Territories on 1 March 1994. A new IGA was signed by Ministers, with effect from 30 April 2012.[13]

The ABCB addresses issues relating to safety, health, amenity and sustainability in the design and performance of buildings through the NCC, and the development of effective regulatory systems and appropriate non-regulatory solutions.

The ABCB has two primary technical advisory committees, the Building Codes Committee (BCC) and the Plumbing Code Committee (PCC). These committees provide a valuable national forum for regulatory authorities and industry to consider technical matters relevant to building and plumbing regulation reform and play an active role in assisting the Board in meeting its obligations.

1.3 About the National Construction Code

The NCC is an initiative of COAG developed to incorporate all on-site design and construction requirements into a single code. The NCC comprises the Building Code of Australia (BCA) as Volumes One and Two; and the Plumbing Code of Australia (PCA) as Volume Three.

The NCC provides the minimum necessary requirements for safety, health, amenity and sustainability in the design and construction of new buildings (and new building work in existing buildings) throughout Australia.

The NCC is drafted in a performance format allowing a choice of deemed-to-satisfy solutions or flexibility to develop performance solutions based on existing or new innovative buildings, plumbing and drainage products, systems and designs.

[13] *An Agreement between the Governments of the Commonwealth of Australia, the States and the Territories to continue in existence and provide for the operation of the Australian Building Codes Board*. 30 April 2012.

2 Background

2.1 Preliminary research

Preliminary research on rainwater harvesting and use in Australia was conducted over 12 months from June 2014 to June 2015. This process comprised a desktop review of publicly available documents covering public policy, regulations and technical guidance publications.

In addition to that review, the ABCB conducted a survey of Australia's Local Governments to establish the nature and extent of their role in setting requirements and providing guidance regarding rainwater harvesting and use in their respective areas. The survey was distributed by email to 533 Local Governments across six States, in addition to the Plumbing Administrations of the ACT and NT, on 25 August 2014. Responses were collected on 19 September.[14] Data from those responses informed the development of the Consultation Paper, which is discussed below.

This preliminary research identified several documents which are relevant to rainwater harvesting and use. The information contained in many of these documents was drawn upon in the development of the Consultation Paper, Draft and Final Reports.

2.2 Consultation Paper

On 8 July 2015, the ABCB released the Consultation Paper for public comment. The public comment period closed on 28 August, 2015.

The purpose of the Consultation Paper was to seek feedback on the information contained therein; the accuracy and objectivity of the interpretation of relevant regulatory structures; the completeness of the research base; and the timeliness of the information sources drawn upon.[15]

The Consultation Paper did not make recommendations. However, it did include a Section providing preliminary conclusions along with a series of consultation questions. Addressing these questions was optional for stakeholders making a submission in response to the Consultation Paper.

A total of 15 responses were received from a cross-section of government and industry stakeholders, across Australia. The majority of submissions directly addressed the consultation questions, and many provided additional information.

2.3 Draft Report

A draft version of this report was developed in 2015. The draft report provided a preliminary set of recommendations in response to the submissions received on the Consultation Paper. The

[14] A total of 46 unique responses were received, predominantly from NSW and Qld. For details, refer to Appendix A of the *Consultation Paper*.

[15] ABCB. *Plumbing Code Development Research Project – Rainwater Harvesting and re-use Consultation Paper* ('*Consultation Paper*'). Canberra: Australian Building Codes Board. 2015. p v.

draft report and its recommendations were considered and endorsed, with amendments, by the PCC in March 2016.

2.4 Final Report

This document is the final version of the report. It incorporates changes requested by the PCC following their consideration of the Draft Report. The Board endorsed the recommendations of this Final Report in June 2016. Work has since commenced to implement these recommendations.

3 The idea of a national approach

The Consultation Paper discussed the idea of a national approach to rainwater harvesting and use. It noted that there are multiple, potentially competing objectives for governments and consumers regarding the promotion and implementation of rainwater harvesting and use. Sustainability objectives for governments and consumer groups tend to motivate their promotion of the increased uptake of these systems. However, health authorities and water suppliers may be less inclined to support rainwater harvesting and use, as it presents uncertainties for them in terms of public health and commercial implications arising from the growing uptake of independent water supplies.

The differing policy objectives of the building, plumbing and planning sectors, as well as those of the health authorities, water authorities and local governments has led to some overlap in regulatory matters. For example, when rainwater harvesting is required as part of meeting building sustainability requirements, and the setting of design standards such as tank sizing, water use and topping-up, catchment areas and the like, are issues relevant to plumbing, but not captured by installation standards. Stakeholders broadly considered rainwater harvesting to be relevant to building, plumbing and planning rather than belonging exclusively to one or another of these disciplines.

Stakeholders were asked to identify other groups whose objectives should be taken into consideration, and whose input should be sought in developing policy options related to rainwater harvesting and use. They were then asked if they considered rainwater harvesting and use to be a planning, building or plumbing matter, or a combination of all three (noting that health controls are a separate matter).

The following covers the idea of a national approach, and considers the supportive submissions as well as those raising concerns. Also included are additional relevant stakeholder groups identified by those who made submissions on the Consultation Paper.

3.1 Support for a national approach

Support for a national approach to rainwater harvesting and use leaned toward bringing the practice together with other building sustainability requirements; with one suggestion being to adopt a broad, target-based model like that of BASIX in NSW.

> *There is a need for a national approach for sustainable buildings that includes both energy and water savings targets for all new and renovated buildings. These performance based targets should permit a range of options, including rainwater harvesting, to meet targets for reduction in energy and water consumption.*
>
> *[The Association of Rotational Moulders Australasia] recommends a national policy approach to energy and water saving targets similar to BASIX in NSW. BASIX includes performance targets that are based on local conditions. … ARMA recommend a national*

> *policy framework that allows each state and territory the flexibility to respond to local conditions.*[16]

The Rainwater Harvesting Association of Australia (RHAA) also expressed support for the BASIX model,[17] although they expressed broader concerns with the national approach too, which are discussed in the next section.

Support for a performance-based national approach, which allowed regional flexibility, came from One Water Naturally Pty Ltd, a Sydney-based supplier of rainwater harvesting products:

> *Ensuring national consistency with regional flexibility due to environmental variables is sensible and need not be prescriptive but resolved by practitioners' experience and local understanding while maintaining the provisions of the code and flexibility that the PCA has always allowed of necessity determined by licensed tradespersons.*

A national approach was also seen as beneficial in terms of reducing conflict and overlap between governments in this area of regulation. As noted by the Housing Industry Association (HIA):

> *As the report clearly sets out, all levels of Government are operating in this space for different purposes and with different authority. In relation to a national approach, this is concerning considering the use of rainwater tanks is not a new phenomenon … A national approach should be possible and an approach which changes little of the current stringency or expectation for occupant safety should also be primary goal.*

3.2 Concerns about a national approach

While there was support among stakeholders for a national approach, there were also concerns, and these should not be ignored. Such concerns were primarily expressed by the RHAA, in their submission which stated:

> *While nationally consistent legislation may be attractive on a neatness principle there are good social, policy, environmental, climatic and geographic reasons for allowing diversity.*
>
> *Water management is a complex issue but at its heart it is a local issue. The rechargeable aquifers in Adelaide are quite different to the need for flood management in South East Queensland and how rainwater harvesting is used will change with the overall context of water management. Local regulations and legislation allow for flexible responses, innovation and reflect local democracy.*
>
> *The potential confusion and inconsistencies of state-based controls are outweighed by the inflexibility and 'dumbing down' of national legislation. Australia faces considerable*

[16] *Sub.* Association of Rotational Moulders Australasia.

[17] *Sub.* Rainwater Harvesting Association of Australia.

economic, climatic and social changes in the coming decades and our regulatory system should provide for local solutions that meet local needs.

The RHAA does not support a national approach to rainwater harvesting regulation and instead supports allowing local variation and innovation to meet local needs.

There are however grounds for a national policy framework on some issues to meet a policy objective. The RHAA strongly supports a national approach to sustainable buildings, although it is expected that local policies will vary the requirements to meet local conditions.

3.3 Relevant stakeholder groups

In general, the relevant stakeholder groups identified in the Consultation Paper were those involved in the building, plumbing, rainwater harvesting, and stormwater industries. Building and plumbing regulatory authorities, water suppliers, health and environment protection authorities were also considered relevant.

In addition to this, a number of specific groups were also identified by submissions:[18]

- Organisations responsible for urban waterway health.
- The Association of Rotational Moulders Australasia (ARMA).
- Stormwater Australia.
- Australian Institute of Building Surveyors.
- Institute of Plumbing Inspectors Queensland (IPIQ).
- Local government Built Environment Sustainability Scorecard (BESS) working groups.
- Green Building Council of Australia (GBCA).

This indicates that while the Consultation Paper appears to have reached a sufficiently broad cross-section of stakeholders, there remains a number of groups who would also have an interest in future work in this area.

[18] *Subs.* M. Pendergast, Association of Rotational Moulders Australasia, Sunshine Coast Regional Council, Queensland Government, Victorian Building Authority.

3.4 Water quality, ownership and accountability

The Consultation Paper provided a substantial discussion on rainwater quality standards, ownership and rights to use captured rainwater, and who should have accountability for its quality. Submissions on the Consultation Paper mainly focussed on the issue of rainwater quality.

On the issue of rainwater quality, the RHAA submission noted that:

> *There is a 20 year history of well documented research of rainwater meeting drinking water quality standards. The key issue for policy makers is even less complicated, about 900,000 Australian households drink rainwater every day and there is no associated epidemic of illness or death. The reasons why rainwater, which can be contaminated, does not result in widespread illness are not simple but the results are very clear.*

The RHAA submission enclosed copies of two scientific journal articles[19] and cited two others[20] in support of the statement quoted above. Overall, the RHAA argued that a majority of rainwater harvesting systems complied with the chemical and metal values in the Australian Drinking Water Guidelines,[21] and that "rainwater storages act as balanced ecosystems in a similar fashion to environmental systems that improve water quality".[22]

The RHAA added, regarding chemical contaminants:

> *[T]he only chemical that a range of research studies have shown is likely to be present at harmful thresholds in rainwater is lead, where point sources of lead leachate are present in the rainwater collection system. The primary point source of lead in new homes is lead flashing and it is noted that NCC Vol Two 3.5.1.2(e) precludes the use of lead where it is intended that the roof is to form part of the potable water catchment area.*

The ARMA made a similar submission citing much of the same data and supporting articles. Both the RHAA and ARMA concluded their comments on this aspect of the Consultation Paper with similar recommendations that "the ABCB not reopen a debate on rainwater harvesting water

[19] Enclosed were: (1) JS Heyworth, G Glonek, EJ Maynard, PA Baghurst and J Finlay-Jones, 'Consumption of untreated tank rainwater and gastroenteritis among young children in South Australia', *International Journal of Epidemiology,* May 2006, pp 1-8; and (2) S Rodrigo, M Sinclair, A Forbes, D Cunliffe and K Leder, 'Drinking rainwater: a double-blinded, randomized controlled study of water treatment filters and gastroenteritis incidence', *American Journal of Public Health,* Vol 101, no 5, 2011. pp 842-7.

[20] AC Morrow, PJ Coombes, RH Dunstan CA Andrew and M Anthony, 'Elements in tank water – comparisons with mains water & effects of locality and roofing materials', *Rainwater and Urban Design Conference,* Sydney, 2007; and CA Evans, PJ Coombes, RH Dunstan, and TL Harrison, 'Extensive bacterial diversity indicates the potential operation of a dynamic micro-ecology within domestic rainwater storage systems', *Science of the Total Environment,* 407, 2009. pp 5,206-15.

[21] NHMRC. *Australian Drinking Water Guidelines.* Canberra: National Health and Medical Research Council. 2011.

[22] *Sub.* Rainwater Harvesting Association of Australia.

quality unless the large body of previous research on the topic has been thoroughly considered and included."[23]

Further to this, the RHAA and ARMA submissions also agreed with the Consultation Paper where it questioned the need for a deemed-to-satisfy list of "permitted uses" of rainwater (as non-drinking water) in Part B3 of the PCA.[24] The ARMA stated:

> *The discussion about permitted uses of rainwater as a non-drinking water supply by the ABCB [in the Consultation Paper] are inconsistent with the use of rainwater for drinking water and various state regulations permitting the use of rainwater for any purpose on private property. The discussion presents an arbitrary determination of rainwater as either non-drinking water supply or as a drinking water supply. ARMA recommends that rainwater supply from a correctly designed rainwater harvesting system be considered to be of drinking water quality regardless of the intended end use (for example non-drinking water uses).*

The ARMA's submission also highlighted what they perceived as an inconsistency in how rainwater is considered based on the availability of a Network Utility Operator's (NUO) drinking water supply:

> *There's a worrying dichotomy in the way urban rainwater harvesting systems and other rainwater harvesting systems that are the sole source or water are treated. It is implied that rainwater is unsafe when a water supply from a water monopoly or water utility is available but safe if [it is not]. The [Consultation Paper] does need to offer solutions to this conflicted position.*
>
> *We are mindful that there are no reported heath epidemics from rainwater supplies in Australia. We believe there should be two clear guides: (1) rainwater harvesting for non-drinking water supplies; and (2) rainwater harvesting for drinking water supplies. Requirements for signs using terms such as "warning" should be removed from rainwater supplies which can be drinking water supplies and are low hazard.*

With respect to property rights over rainwater, and the use of rainwater as a public water supply, the ARMA submitted:

> *The removing of property rights of citizens to favour water monopolies is not an acceptable outcome of this process. Similarly, connection to reticulated water supplies should not be mandated. However, ARMA supports implementation of testing regimes for public rainwater supplies but highlight that any test should be adequate to accurately assess potential contamination of rainwater supplies. We are mindful that detected presence of*

[23] *Subs*. Association of Rotational Moulders Australasia; Rainwater Harvesting Association of Australia.

[24] *Ibid.*

coliform and e coli bacteria may not indicate faecal contamination as many of these bacteria are harmless environmental species.[25]

In some contrast to the ARMA's comments (above), Queensland Health expressed significant concerns with roof harvested rainwater quality:

While it is true that the epidemiological studies, referred to in EnHealth's 'Guidance on the use of rainwater tanks' document, did not show that the consumption of roof-harvested rainwater resulted in an increase in illness, it is also true to say that studies that have focussed on the quality of RHRW have identified significant concerns.

Recent studies completed in South-East Queensland have shown that the majority of rainwater samples contained indicators of faecal contamination and a significant proportion contained disease-causing organisms (pathogens). Some of the pathogens isolated in samples of roof-harvested rainwater have very low infectious doses and – while it is acknowledged that the consumption of roof-harvested rainwater is unlikely to pose a health risk to healthy individuals, particularly those that have drunk roof-harvested rainwater for an extended period – we believe that certain sub-sets of the population may be at an increased risk of becoming ill.

People at an elevated risk of becoming ill from consuming roof-harvested rainwater are infants, the elderly and immuno-compromised people such as transplant, dialysis, HIV or cancer patients with severely weakened immune systems.

The Queensland Department of Health therefore recommends that anyone who may be vulnerable to pathogens that could occur in roof-harvested rainwater – or who may supply this water to other household members or guests who could be considered vulnerable – consider implementing appropriate control measures to ensure the safety of their rainwater. In summary, we feel that the consumption of roof-harvested rainwater is unlikely to pose a significant health risk for most people. However, there is an increasingly larger sub-set of the population that will be at a greater risk of becoming ill and adequate precautions should be taken for these people. This is a subtle departure from the guidance contained in the enHealth guidelines.

A copy of the Queensland Department of Health's factsheet on the health risks associated with consuming roof-harvested rainwater is [here[26]*].*

[25] *Sub.* Association of Rotational Moulders Australasia, citing: C Luou, DM Gorland, M Feldgardene, JM Tiedjef and KT Konstnatinidisa, 'Genome sequencing of environmental Escherichia Coli expands understanding of the ecology and speciation of model bacterial species', *Proceedings of the National Academy of Sciences (USA),* 2011.

[26] See: www.health.qld.gov.au/publications/public-health/industry-environment/environment-land-water/Water/factsheet-rainwater.pdf.

The Victorian Building Authority (VBA) suggested that the PCA can recognise rainwater as drinking water supply, even if the Scope of Part B1 appears to only include properties connected to the NUO's supply, i.e. "connected to the drinking water supply" rather than "a drinking water supply" (emphasis added).[27]

> *We believe the interpretation of Part B1 should be read broadly, to mean that it could also include rainwater where this is the drinking water supply (i.e. where there is not a reticulated water supply and rainwater is the main supply), in addition to the more common reticulated water supply source meaning. This is important as in cases where there is no reticulated water supply (and rainwater is the drinking water supply), the various requirements under Part B1 are relevant and applicable, otherwise it could be interpreted to mean that on these properties, Part B1 does not need to be complied with.*

The VBA also sought clarification regarding the discussion on BP1.1.

> *Further clarification on why BP1.1 can only be complied with by way of an Alternative Solution – it is not clear why the author [of the Consultation Paper] believes this to be the case.*

The point being made in the Consultation Paper was that while this Performance Requirement states that certain outlets must be connected to a drinking water supply, there is no corresponding Deemed-to-Satisfy Provision. This is because neither the PCA nor AS/NZS 3500.1[28] actually specifies what is acceptable as a 'Deemed-to-Satisfy' drinking water supply under the PCA. If there was such a specification, the PCA would in effect be mandating connection to the NUO's drinking water supply (assuming one is available to the site). This would be beyond the scope of the PCA, and potentially beyond the regulating power of its enabling legislation.

3.5 Building, plumbing and planning regulations

Stakeholders broadly considered rainwater harvesting to be relevant to building, plumbing and planning rather than exclusively belonging to one or another of these disciplines. Different parts of the rainwater harvesting system fall under different responsibilities. There were broad ranging views, which varied from rainwater harvesting as part of an overall integrated water cycle management system for cities, to its being fully a plumbing matter.

Rather than focussing on rainwater harvesting being either building or plumbing or planning, the ARMA, in their submission, explained that they view rainwater harvesting holistically, as a part of integrated water cycle management:

[27] ABCB. *National Construction Code Volume Three – Plumbing Code of Australia ('PCA 2016').* Canberra: Australian Building Codes Board. 2016. cl B1.0.

[28] Standards Australia. *Australian Standard/New Zealand Standard 3500 Plumbing and Drainage – Part 1: Water Services.* 2015.

The Research Report by the ABCB focuses on rainwater tanks as an isolated concept. However, ARMA highlights that buildings are a connected system that provide integrated responses and that buildings are linked (part of) the entire system for energy, water and environment responses in a city or region. It is recommended that the ABCB focus on rainwater harvesting as part of a system that operates in a building and across a region.

Further discussion and illustration of the principle of integrated water cycle management was also provided by the RHAA, along similar lines to the above.

The VBA considered rainwater harvesting to be "a combination of all three". The Sunshine Coast Council responded similarly, and provided an explanation of difference between the planning and technical roles:

It [rainwater harvesting] is a combination of all of the above. Local planning schemes may set provisions regarding size, intended locations, heights etc.

Planning matters include understanding the volume of water within the catchment area and how to discharge this water into the natural environment.

The containment of rainwater, either temporarily or permanently, has an impact on the local environment. Understanding this impact in each local area is of high importance to a council's understanding of issues such as flooding.

Technical provisions are located in the BCA and the PCA, but consideration should be given to locating all provisions in the one technical standard.

The planning function was further specified in the Queensland Government's submission which described the separate contexts of 'property' and 'estate' level requirements, as a way of delineating from the building role:

1. Property level: The rainwater tank installation will be covered as both building and plumbing matters, as they are included as part of the building's design and construction, and are subject to building approval (QDC 4.2 & 4.3) and plumbing approval and inspection.

2. Estate level: Where rainwater tanks are included as part of the water balance/stormwater management calculations of the new estate, all three matters will apply – planning, building and plumbing.

The HIA described in detail both the plumbing and building responsibilities, however they took the view that planning should have no role:

Plumbing should be responsible for the technical matters related to tank size and roof catchment, installation and connection to the house. Building should be responsible for any minimum standards for distances from boundaries and locations. It would be preferable that planning had no functional role in this issue. However it is recognised that some jurisdictions have included water efficiency (as part of sustainability objectives) in

> *planning regulations. Shifting these requirements, where they exist, into building regulations would be preferable to ensure that sustainability requirements do not lead to the need for a planning approval, when only a building approval would otherwise be required for a building, such as a dwelling.*

The Master Plumbers Association of Queensland (MPAQ) and Master Plumbers and Gasfitters Association of Western Australia (MPGAWA) both took the view that rainwater harvesting is a plumbing matter:

> *If water collection is just for watering / irrigation purposes, or is piped through the property to supply fixtures it is primarily a plumbing issue. The design and installation for reuse of rainwater squarely falls under plumbing.*

Overall, there does not appear to be any consensus amongst the responding parties as to how rainwater harvesting and use fits into each of the plumbing, building and planning areas. Issues of conflict and overlap between the three may need to continue to be managed on a case-by-case basis, depending on the higher level objective at the time.

3.6 Application of the PCA

Although it does not specifically mention "rainwater",[29] the PCA contains a number of requirements which may apply to rainwater harvesting and use. Depending on whether the rainwater is intended for use as drinking water or non-drinking water, either Part B1 or Part B3, respectively, could apply. The intended use of the rainwater also affects the applicability of material and product certification requirements (discussed later in this report).

The reason the PCA 'may' apply, and not 'will' apply, is because it is not clear within the PCA whether a rainwater tank is part of a water service within a property, or if it is considered to be the water supply to a property. The PCA applies differently under these scenarios, which is reflected in the implementation of the PCA definition of 'point of connection'[30] by some jurisdictions.

The following is a summation of each jurisdiction's coverage of rainwater harvesting systems under the PCA, as applied in their plumbing legislation.

- **ACT**: PCA only applies where plumbing is connected to the NUO supply.
- **NSW**: PCA applies only from the tank to the outlets.
- **NT**: Covered.
- **Qld**: PCA applies only from the tank to the outlets.

[29] Except in the NSW, SA and Tasmania Appendices.

[30] *PCA 2016,* above n 27, cl A1.1. In this context, "the point where the service pipe within the premises connects to the *Network Utility Operator's* property service or to an alternative water supply system."

- **SA**: Covered.
- **Tas**: Covered.
- **Vic**: Covered.
- **WA**: Not covered (except topped up systems).

This uncertainty attracted limited comment in the submissions received on the Consultation Paper. Nonetheless, the MPAQ and MPGAWA submissions appeared to agree with the view that the PCA applies to rainwater systems, even if it does not mention rainwater.

3.7 Separate approaches to drinking and non-drinking rainwater supplies

Rainwater can be and is used as a drinking water supply. However it is also a form of non-drinking water supply, and where collected only for that purpose, different regulatory requirements would apply. This need for separate approaches to drinking and non-drinking rainwater supplies, if rainwater were to be recognised in the PCA, was the subject of several submissions.

The HIA's submission described the need for separate approaches as follows:

> *It is important to create much clearer direction for rainwater harvesting used for non-drinking purposes, which is the area of use that has increased in the last decade, and rainwater harvesting used for drinking purposes, which has occurred for decades and will continue for many in non-urban areas. Creating a distinct separation between the two types of tanks will allow more targeted controls to be used for the right purposes.*

The MPGAWA and MPAQ submissions suggested the following separation of requirements between drinking and non-drinking rainwater harvesting:

> *The harvesting of rainwater should be split into two different sections:*
>
> - *Rainwater harvesting supplementary to the mains supply, as documented in AS/NZS 3500, Part 1, Section 14. Supplying to non-drinking outlets, toilet cisterns etc.*
> - *Only tanks over 1500 litres to be included. A minimum catchment area of approximately 50 square metres.*
> - *Rainwater harvesting as the only means of collecting water feeding all outlets in the property, with UV screening and filtering mandatory to all drinking water outlets.*
>
> *Also of note for discussion is rainwater tank overflow disposal. The overflow must be of sufficient size to cope with the design rainfall intensity for the area it is being installed in and must be discharged to the normal stormwater network, or diverted to appropriately sized soak wells.*

The Queensland Government's submission suggested the following direction be taken, regarding the future of the PCA:

> *The PCA should be performance-based and cover all types of rainwater harvesting systems. Where possible, relevant provisions of Australian Standards should be incorporated into the PCA for ease of reference. No new or additional Australian Standards should be developed for these PCA provisions.*

3.8 Rainwater tanks in bushfire-prone areas

In its submission, the ARMA raised an issue for clarification around the requirements for polyethylene rainwater tanks in bushfire prone areas.

Although not mentioned in the Consultation Paper, it is considered appropriate that the issue be noted here, so that a response may be provided, given the relevance of the NCC to construction in bushfire-prone areas, and the fact that BCA additions do require, or at least promote, the construction of rainwater tanks in some jurisdictions, and that the PCA, to some degree, governs their installation.

The ARMA's submission stated as follows:

> *There is evident confusion around the use of rainwater harvesting systems in bushfire prone areas that could be clarified in the Code in future versions. The Country Fire Authority (CFA)[31] regulations, in some locations, may require a certain amount of water to be available for fire-fighting. Acceptable solutions include water being stored in swimming pools, dams or rainwater tanks.*
>
> *In some areas, local government certifiers have interpreted these rules to mean that when using rainwater tanks as an acceptable solution, this is not allowed to be in polyethylene tanks which they mistakenly believe may be combustible.*
>
> *This appears to be inconsistent with the frequent use of polyethylene tanks both at CFA stations and for the containment of fire-fighting water on fire-fighting vehicles. In Victoria, there is additional confusion around regarding correct interpretation of the BAL [Bushfire Attack Level][32] code system (BAL relates to the materials used and the method of construction of the house) to apply to water tanks, therefore incorrectly suggesting that polyethylene water tanks cannot be used. In fact, rainwater tanks do not fall under that code.*

[31] The Country Fire Authority (CFA) is a fire authority constituted in Victoria under the *Country Fire Authority Act 1958* (Vic) s 6.

[32] 'BAL' or 'Bushfire Attack Level is defined in *Australian Standard AS 3959: 2009 Construction of buildings in bushfire-prone areas*.

Currently there is a range of responses to this issue by various authorities across Australia including:

- *No polyethylene tanks allowed on some properties.*
- *Fire-fighting water tank not allowed to be polyethylene but other tank can be.*
- *Fire-fighting water tank allowed to be polyethylene but must be reconfigured to ensure fire-fighting water is available.*

It is ARMA's recommendation that the code be clarified to confirm that fire-fighting water tanks are allowed to be polyethylene but must be reconfigured to ensure fire-fighting water is available, consistent with the policy of the local CFA.

It would be difficult to argue that the ARMA, as the peak body for the polyethylene rainwater tank industry in Australia[33] does not have a clear interest in promoting the use of polyethylene tanks. However, this does not necessarily defeat the case for considering the issue they have raised, as there may be a broader net benefit able to be realised from clarifying the existing regulations, even without a change in policy.

3.9 Rainwater harvesting, water conservation and the NCC

The Consultation Paper provided discussion of the role of the NCC in promoting water conservation/efficiency. In particular, it provided a summary of an earlier report, the Water Efficiency Scoping Study,[34] along with a broader discussion of water efficiency/conservation in the context of the PCA.

The differences between water efficiency and conservation were described, and were related to, the PCA. The Consultation Paper then explained water efficiency as, essentially, the idea of designing systems which enable the same uses of water to occur, but with less environmental impact.

Water efficiency can be defined as:

> *The optimised use of water commensurate with need, which is not based on objective indicators only, but considers equally subjective need.*[35]

The equal consideration of objectively and subjectively defined 'need' (for water) is what distinguishes water efficiency from water conservation. Another way of explaining this distinction

[33] *Sub.* Association of Rotational Moulders Australasia.

[34] GHD. *Scoping study to investigate measures for improving the water efficiency of buildings,* prepared for the Department of Environment and Heritage (Cwlth). 2006.

[35] K Adeyeye, 'Water Policy and Regulations: a UK Perspective'. In *Water Efficiency in Buildings – Theory and Practice,* K. Adeyeye (ed.), Wiley-Blackwell, 2014. p 6.

was provided by the Productivity Commission in its 2011 inquiry into Australia's urban water sector:

> *Water conservation is sometimes defined to mean essentially the same thing as water use efficiency, but where it has a separate meaning it may be defined as: a reduction in water use that also causes a reduction in the level of useful output or outcome. Under this definition, watering a vegetable garden less is a water conservation practice if it reduces the yield of vegetables and water use efficiency practice if it does not.*[36]

Based on these definitions, it was considered that rainwater harvesting is related to water efficiency, more so than conservation, as it prevents unnecessary uses of public drinking water supplies, while also avoiding any reduction in output. The use of rainwater means, for example, that the garden can still get watered, but without unnecessarily drawing from the public drinking water supply. This part of the Consultation Paper attracted several comments:

The RHAA suggested that:

> *The key issue for rainwater harvesting is neither water efficiency nor conservation. Rainwater harvesting is part of an integrated water management approach and is one of a range of options for urban water management.*
>
> *[It] is a water source that reduces peak flow, daily demand and annual demand on potable water supplies. This has long term implications for water infrastructure including sizing of reservoirs, desalination plants, treatment plants and pipe infrastructure. This in turn reduces capital infrastructure costs and has major implications for the long term costs of operating that infrastructure. In SEQ [South East Queensland] the benefits to all new homes having water saving targets amount to over $3 billion in operating costs alone up to 2056.*

Related to the South East Queensland experience, the Sunshine Coast Council's submission offered the following advice about rainwater harvesting as a water conservation measure:

> *History of rainwater capture and re-use on the Sunshine Coast*
>
> *Approximately one-third of dwellings on the Sunshine Coast lie outside the reticulation area of Unitywater. These dwellings/households rely upon rainwater capture for their potable and non-potable water supplies. Most household supply is held in rainwater tanks and supplementary supply is held in rural dams. During extended dry periods, household supply is supplemented by water tank deliveries, a very expensive alternative.*

[36] Productivity Commission, *Australia's Urban Water Sector,* Inquiry Report no. 55: Volume 1, Canberra, August 2011. p 65.

Wherever households are reliant on tank water (or dam storage water), on-site pumps are required and this is expensive in respect of maintenance and energy charges. Large tanks also need cleaning out on a regular basis.

Within the last decade or so, the restrictions against rainwater tanks in urban services areas have been lifted. There were several factors contributing to this on the Sunshine Coast:

- *tanks were viewed as providing some storage within the local drainage system for short duration storm events; and*
- *sustainability issues started to arise, and rainwater tanks were seen as providing water efficiency/conservation by using untreated supply for gardens, toilets and clothes washing; and*
- *tank supply was able to supplement the reticulated supply, lessening draw-down demand on reticulation systems that may be at capacity during peak load periods (e.g. 4 – 7 pm).*

For a short period after amalgamation, rainwater tanks were required as a condition of subdivision approval to minimise trunk drainage systems, but this was soon dropped as there was no way to guarantee that the tanks would be empty (or have reasonable capacity) at the start of a rain event.

Legislative changes

QDC MP 4.1 — Sustainable buildings became effective on 1 March 2006 and required new dwellings located in a reticulated town water area to be provided with rainwater tanks (or other water supply systems).

An independent cost-benefit analysis of rainwater tank and water savings laws carried out by the Queensland Competition Authority (QCA) concluded that the costs associated with mandating rainwater tanks for new houses will generally outweigh the overall benefit to the community.

The QCA analysis recognised the net benefit of compulsory rainwater tanks for new houses will vary depending on the location and the current and future water demand and augmentation needs of these houses. The QCA recommended that local governments be able to seek approval to "opt in" to the laws where they can demonstrate that opting in will result in a net benefit to the community.

Subsequently, laws were amended to allow local governments to apply to the Minister to "opt in" and, at the same time, laws that required the mandatory installation of rainwater tanks were repealed on 1 February 2013. This Council did not choose to "opt in".

> *As a result, there is currently no requirement for houses within a reticulated water supply area of the Sunshine Coast to be provided with rainwater tanks. Property owners may still voluntarily install a rainwater tank. However, some older development approvals may still require rainwater tanks as a condition of approval.*

The VBA's submission also offered advice as to the history and rationale behind their requirements (Vic Additions to NCC Volume Two), in relation to building sustainability:

> *Under the last paragraph [of Section 2.1 of the Consultation Paper] regarding the introduction of building sustainability requirements in some jurisdictions, it should be noted that this has occurred in Victoria due to the perception (whether correct or not) that current building controls under the NCC are inadequate and do not sufficiently address these matters. This therefore results in a number of local governments implementing additional sustainability measures through their local planning framework to achieve these outcomes.*
>
> *Specific examples of where this has occurred include amendments to the local planning scheme requiring Green Building Council of Australia's Green Star criteria for water efficiency (incorporating rainwater harvesting) to be met. Furthermore the introduction and specification of the Built Environment Sustainability Scorecard (BESS) scheme by a number of inner Melbourne councils (e.g. Moreland, Yarra, Stonnington etc) includes water efficiency requirements. These planning scheme provisions would be another driver for rainwater harvesting and re-use.*

As can be seen from the above comments, water conservation/efficiency policy has been made on a local and State/Territory level in recent times, leading to a variety of different approaches. This has in turn affected policies relating to the use of rainwater harvesting as a water conservation measure.

At the national level, water efficiency is also covered by the Water Efficiency Labelling and Standards scheme (WELS), which aims to, among other things, conserve water supplies by reducing water consumption, and promote the use of water efficient products.[37] The application of the WELS is not limited to conserving the public reticulated water supply, rather it appears to consider all (drinking) water sources equally. This approach suggests that rainwater harvesting is not a substitute for other water efficiency measures.

[37] *Water Efficiency Labelling and Standards Act 2005* (Cwlth) s 3.

4 Material and product standards and certification

Although rainwater tanks are currently an exempt product under the WaterMark Scheme,[38] the materials and products which are used in pipework downstream of the tank may require certification and authorisation and, depending on whether or not the rainwater is intended as a drinking water supply, compliance with AS/NZS 4020.[39]

With regard to any material or product used in a top-up line, i.e. between the NUO's supply and the rainwater tank (with no off-takes between these two points), the certification situation is unclear. This is because it is not clear if this pipework would need to be compliant with the PCA.

Stakeholders were asked their preferred method of ascertaining that the materials and products are fit for purpose, and to identify any difficulties or 'grey areas' they have come across when seeking to ascertain whether or not a rainwater harvesting and use system (or part thereof) is fit for purpose.

The following covers comments made in submissions that addressed material and product certification, and 'fitness for purpose' generally, as discussed in the Consultation Paper.

4.1 Role of WaterMark and relevant product standards

A number of submissions suggested that the role of the WaterMark Certification Scheme in relation to rainwater harvesting systems needed to be reconsidered. It was also suggested that other product standards, not currently part of that scheme, be elevated into its regulatory framework.

The VBA, in their submission, put the case for this as follows:

> *Whilst rainwater tanks are currently on the WaterMark exempt list of products, this listing should be reviewed in the context of the changing environment in which they are currently installed and used. The increasing percentage of rainwater tank installations in urban areas including connection to internal uses changes the risk profile. The increasing focus on stormwater capture and reuse, including for water heating purposes, means there is a need to reconsider whether the current WaterMark exemption is appropriate.*
>
> *There have been incidents in the past where rainwater tanks containing lead in solder joints were installed in Tasmania leading to contamination of the water source. It is recommended that all rainwater tanks and any associated parts/components of the system e.g. pumps, are WaterMarked.*

A similar view was taken by the Sunshine Coast Council in their submission:

[38] ABCB, *WaterMark Certification Scheme List of Exempt Materials and Products*, Canberra: Australian Building Codes Board. 20 February 2013.

[39] *AS/NZS 4020*, above n 3.

The purpose of WaterMark is to provide the public and assessment officers a clear and definitive way to ensure that a product is suitable for use and will not cause harm if used.

This should apply to any new appliance, product or fixture that can be connected to a plumbing system. As rainwater has the potential to be used as drinking water, unlike irrigation services, it can and should be apply to rainwater systems.

WaterMark products can alleviate most concerns downstream of the gutter, provided the rainwater tank complies with the following standards as applicable:

- *AS 3735 – Concrete structures retaining liquids*
- *AS 2180 – Metal rainwater goods – Selection and installation*
- *AS/NZS 4766 – Polyethylene storage tanks for water and chemicals*
- *AS/NZS 4020 – Testing of products for use in contact with drinking water.*

From within the plumbing industry, the preferred methods for ascertaining that the materials and products to be used in a rainwater system are fit for purpose were described as follows:

Seek assistance from a reputable manufacturer / supplier and ensure all products are certified.[40]

Supplier credentials and perceived quality product that is capable of integration with disparate suppliers products needed for the designed system. Rainwater systems are not generally packaged and rely on selective choices to configure the designed or desired system.[41]

Submissions from the rainwater industry were also supportive of a regulatory role for WaterMark, as well as AS/NZS 4766. The RHAA submitted that:

For plastic rainwater tanks made in Australia, certification to AS/NZS 4766 (Polyethylene tanks) should be mandatory. AS/NZS 4766 covers all the requirements of Watermarking plus the extra benefits of ensuring the product has been designed and manufactured and is fit for its intended purpose.

The ARMA made a similar recommendation to that of the RHAA regarding AS/NZS 4766, and added:

It should also be noted that no such standards exist for the design and construction of steel, concrete and FRP [fibre-reinforced plastic] tanks, and this should be addressed.

[40] *Subs.* Master Plumbers Association of Queensland, Master Plumbers and Gasfitters Association of Western Australia.

[41] *Sub.* One Water Naturally Pty Ltd.

4.2 Ascertaining fitness for purpose

The Consultation Paper also asked stakeholders to identify any other difficulties or 'grey areas' they may have come across when seeking to ascertain whether a rainwater harvesting system (or part thereof) was fit for purpose. The following were highlighted:

> *Convincing and/or encouraging installers to install items such as first flush diverter units, gutter guards and insect/mosquito screening devices, where there is no legislation to support.*[42]
>
> *Some facilities store water in tanks to ensure consistency of supply, may provide environments where disinfectant residual diminishes over time, sludge or bio-film builds up, creating an environment conducive to Legionella growth. Tanks can also be subject to increased temperatures dependant on the area and position they are installed. Tanks should be monitored and cleaned periodically.*[43]
>
> *Review / revise HB-230-2008 Rainwater Tank Design and Installation Handbook and/or develop it into a full Australian Standard.*[44]
>
> *It should be noted that there is no way to guarantee untreated rainwater is fit for consumption and therefore [it] should not be considered as potable water.*[45]
>
> *Quality of the soil/contamination are issues which affect the quality of water entering a tank, e.g. chemicals in the soil leaching into the pipework.*[46]
>
> *Gaining an understanding about the latest research on rainwater capture and storage systems to minimise health risks e.g. effectiveness of first flush devices, capability of tank size to drain and re-fill and the application of the rainwater (outdoor only or indoor and outdoor connections).*[47]

For backflow prevention devices with rainwater tanks, Queensland recently clarified this in a Newsflash.[48] [49]

[42] *Subs.* Master Plumbers Association of Queensland, Master Plumbers and Gasfitters Association of Western Australia.

[43] *Ibid.*

[44] *Ibid.*

[45] *Sub.* Master Plumbers Association of Queensland.

[46] *Sub.* Sunshine Coast Regional Council.

[47] *Sub.* Queensland Government.

[48] The Newsflash can be found at: http://www.hpw.qld.gov.au/SiteCollection/Documents/BuildingAndPlumbingNewsflash542.pdf.

[49] *Sub.* Queensland Government.

5 Design considerations and guidance material

There are a number of issues to consider in designing a rainwater harvesting and use system. These include tank size, where it is not set by regulation; expected water usage; and determining how much water can be collected. Further issues include optimisation of tank size relative to household usage; and the effect of increases in catchment area, relative to tank size. Each of these considerations are essentially processes of calculation and estimation, however their methodologies vary in complexity and accuracy, and are currently contained in a broad range of consumer, technical and scientific publications.

The Consultation Paper noted that the identified design guidelines (such as HB 230[50]) have not been updated in more than five years, and as such do not reflect contemporary scientific research, or major changes, such as the introduction in 2011 of the NCC.

To gain further information on this issue, stakeholders were asked to identify any aspects of system design they believed were important, as well as the guidance documents they used.

5.1 System design considerations

This section discusses system design considerations which, although generally not regulated (there are exceptions), are important to enable the system to operate effectively, and so meet the objectives discussed earlier in this report. The Consultation Paper covered issues such as estimating expected water usage, and efficient sizing of rainwater tanks. However, as can be seen from the following, there are a broader range of issues that must be taken into account.

In both the Consultation Paper and the discussion below, comments were generally framed in terms of identifying items that are missing from, or not well covered by, the existing guidance materials (HB 230 etc.). The following items were raised in submissions:

Header / day tanks

> *Header / day tanks should be recommended for use, particularly where tanks are used for toilet flushing. The standard design at the moment uses a high pressure pump that is operated every time the toilet flushes. By using a gravity header tank with dual inlets (one for tank water, one for mains water – with an air gap), the pump will only need to operate once per day, and its flow rate and pressure requirements can be reduced. The plumbing also needs to deliver sufficient flow rates into the toilet cistern at low pressure from the header tank.*[51]

[50] *HB 230*, above n 2.

[51] *Sub.* M. Pendergast. Similar issue noted in *Sub.* Aquatrek.

Overflow sizing and the effect of screens on discharge rates

Screens on the overflow pipe at the tank outlet required by the handbook reduce the overflow rates contained within AS3500 air gap calculations. When screens are added, they contribute to blocking of the overflow, which means the calculation of overflow rates is no longer a "deemed-to-satisfy" solution.[52]

Backflow / contamination of tank water

Potential for backflow of water from the tank into the water supply pipe work (possible legionella and gastrointestinal illnesses – refer part 2.2 of the [Consultation Paper]) without a maintained backflow device – it should be recognised that dual check valves are only warranted for 1 to 2 years.

Insect access and breeding within the tank remains an issue in some areas.

Hydraulic grade line of above-ground tanks in relation to wet pipe systems.

If an opening of a tank is installed 150 mm above-ground level, theoretically this could be the same level or lower than an adjacent flood level prescribed within civil engineering calculations. As such, this could potentially allow ground/surface water to enter the rainwater tank. Provision of flood levels should be incorporated in the calculation of minimum levels of screened openings of a tank.

Backflow of stormwater into the rainwater tank from the stormwater system where surcharge relief not available (e.g. stormwater pit). An air gap or reflux valve is required to be installed on the outlet of the tank. This has been proven to be redundant for above-ground tanks where the overflow individually terminates within a grated stormwater surcharge pit, thus creating an air gap within the overflow pipe; this negates the need for either an air gap or reflux valve. [53]

5.2 System configurations (detailed submission from ARMA)

The ARMA made a detailed submission which covered a number of points regarding system design considerations. It cited several scientific papers and other data, and while too lengthy to quote directly here, the extracts below outline the issues raised:

The [Consultation Paper] discusses issues relating to optimum system configurations that refer mostly to "tank sizes". However, modern independent research and field observations reveal that the tank sizing is not the key variable for design of optimum rainwater harvesting systems. Optimum design of rainwater harvesting systems is

[52] *Sub.* Sunshine Coast Regional Council.

[53] *Ibid.*

dependent on the patterns of demand for rainwater, frequency and magnitude of rainfall, roof catchment area and rainwater storage capacity. The order of importance of these parameters varies with climate and demographic inputs.

There are non-linear relationships between rainwater yields, roof areas and tank sizes with increases in rainwater yields diminishing with increases in tank size and roof area…[T]he primary variable for optimum rainwater yields was demand for rainwater.

In an urban area with reticulated water supply, the optimum performance of rainwater harvesting systems was achieved by a frequent emptying of the rainwater storage which allow additional refills from roof runoff…However, the design objective for areas that are solely reliant on rainwater supplies must aim for security of rainwater supply as indicated by maintaining rainwater storage. This is a fundamental issue for system design and performance of rainwater harvesting systems.

The ABCB present a discussion about average household demands for reticulated water for various regions and presents this reticulated water use as the actual water use in a household. However, average demands for reticulated water use include many buildings with different demographics and water saving initiatives.

The ABCB provide discussion about a range of simple methods for estimating rainwater yields from rainwater harvesting systems. This includes discussions about runoff factors, absorption and wetting factors which are presented as implausibly high or too coarse to provide accurate indications. Whilst runoff coefficients of 0.8 to 0.85 are referenced in many publications, we should be mindful that these numbers originate from studies where the effective roof area was unknown. The factors for wetting and absorption of rainwater into roofs of 2 mm/month have a similar uncertain origin. As outlined by Coombes and Barry (2007), if the roof area and configuration of the rainwater harvesting systems is known, the rainfall losses from that system are small (for example, a runoff coefficient of greater than 0.95 is more suitable).

Analysis of the expected performance of rainwater harvesting systems in models is strongly dependent on demographics, patterns of demands for rainwater, long sequences of historical rainfall and the time step of analysis. For example, analysis at daily or monthly or annual time steps can produce errors ranging from 20% to over 80% for the performance of rainwater harvesting systems.

5.3 Technical guidance material

The technical guidelines identified by stakeholders as most commonly used were HB 230, the PCA and AS/NZS 3500 (both in a guidance capacity), and State and Territory regulatory and non-regulatory documents. Examples included the Queensland Development Code (QDC) and the VBA Technical Notes. These documents were mentioned in the majority of submissions to the Consultation Paper. HB 230, being focussed specifically on the design and installation of rainwater tanks, was the most often mentioned.

In the Consultation Paper, it was noted that while the technical information contained in HB 230 largely remains valid, much of the Handbook's non-technical content is now potentially outdated. On these points, a number of comments were made in the submissions received.

The RHAA noted:

> *The RHAA is pleased the [Consultation Paper] references HB 230 and the RHAA continues to support this as the key Australian design guidance. The RHAA will consider providing an updated version.*

A similar expression of support for the RHAA and HB 230 was also expressed by the ARMA.[54]

The Master Plumbers' groups noted:

> *[HB 230] is used extensively with good information and diagrams. On the downside, the document should now be reviewed and updated after seven years of publication.*[55]

The HIA made a similar comment, but included a broader range of the standards referred to in the Consultation Paper:

> *It would appear that several of the reference documents and Handbook discussed in section 2 of the [Consultation Paper], and potentially some of the reference documents in Appendix "C" need to be reassessed for currency and appropriateness for ongoing use. A number of these Standards overlap in their subjects and clauses.*

[54] *Sub.* Association of Rotational Moulders Australasia.

[55] *Subs.* Master Plumbers Association of Queensland, Master Plumbers and Gasfitters Association of Western Australia.

6 Conclusions and recommendations

This section sets out the report's conclusions and recommendations.

6.1 A national approach

(1) A national approach to rainwater harvesting and use received support from key industry groups, although this support tended toward the development of an all-encompassing building sustainability framework in the NCC, based on the NSW BASIX scheme.

(2) An all-encompassing building sustainability framework has some merit. This is because a single, quantifiable measure of building sustainability in the NCC may resolve a number of broader inconsistencies nationally. However, given that this project primarily concerned issues around rainwater harvesting and use, these broader building sustainability issues are considered to be outside its scope.

(3) Concerns were raised that a national approach may potentially detract from current flexibility available to industry by reducing options for local variation and innovation to meet local needs. However, this suggests that a national approach would by definition prescribe a single, one-size-fits-all solution for all places. In fact, this would not be recommended. Local differences can and should be accommodated within a broader national regulatory framework, and there are many examples already in the NCC where this occurs (e.g. wind regions and climate zones).

(4) The Consultation Paper reached most of the known relevant stakeholder groups involved in rainwater harvesting and use. Where appropriate, further engagement could be sought with the stormwater industry and those involved with waterway health, as well as the Green Building Council of Australia, whose rating system takes into account water usage and source.

(5) Overall, and considering the above summary, the submissions received did not identify any issues that would prevent a national approach being pursued.

Recommendation 1

That it be noted that a national approach to rainwater harvesting and use is generally supported by industry, that any work associated with this report be limited to rainwater harvesting and use only, and that further engagement be undertaken with the most affected industry sectors in the development of any future regulatory or guidance material.

(6) Rainwater quality does not appear to be a major cause for concern among stakeholders, although it is noted that it may be unsuitable for some people with weakened immune systems. In any case, there was no suggestion made in the submissions received that the PCA should be involved in rainwater quality matters, or that other water quality protections need to be strengthened.

(7) A substantial body of research has been identified which appears to confirm that rainwater is, generally, safe to drink. This assumes it is collected and stored safely. Within the NCC, limited protections already exist that help ensure safe collection and conveyance of rainwater. These are the prohibition of lead flashing on roofs used as drinking water catchments (NCC Volume Two), and the requirement for materials and products in contact with 'drinking water'[56] to comply with AS/NZS 4020.

(8) Despite the above, submissions from the rainwater industry have highlighted an inconsistency whereby the current regulations imply that rainwater is safe to drink if it is the only available supply, but not if there is also an NUO supply available.

(9) Submissions also confirmed the Consultation Paper's observation that PCA DtS Provision B3.3 is inconsistent with various State regulations permitting the use of rainwater for any purpose on private property.

(10) The submissions received and the relevant legislation considered in this report indicate clearly that rainwater harvesting and use systems are subject to compliance with the PCA in most jurisdictions. The PCA however makes no mention of rainwater systems in its national provisions. Given the application of the PCA, this is considered to be an anomaly that should be addressed.

(11) If rainwater harvesting were to be formally recognised in the PCA, it could be included in a new Part into the PCA specifically dealing with rainwater harvesting and use. This new Part may be designated 'Part B5', contain specific provisions, and would operate in conjunction with other relevant Parts of the code, such as Performance Requirement BP1.1.

Recommendation 2

That the PCA be amended to recognise rainwater harvesting and use under a new Part (i.e. 'Part B5'), and to consider the deletion of Deemed-to-Satisfy Provision B3.3.

Recommendation 3

That the text of Performance Requirement BP1.1 (and the identical BP2.1) be moved to the Deemed-to-Satisfy Provisions, and replaced with new wording to the effect that the water supply to these installations must not pose an undue risk to the health of users. This clarifies the intent of the PCA requirement, and that the most common (i.e. Deemed-to-Satisfy) way of meeting that intent is to connect the installation to the intended 'drinking water' supply (which may be rainwater, see Recommendation 2).

[56] If the definition of drinking water: "water intended primarily for human consumption" is read broadly to include rainwater captured primarily for human consumption (*PCA 2016,* above n 27, cl A1.1).

(12) Concern was raised regarding consistent technical requirements for polyethylene rainwater tanks in bushfire prone areas warrants some further investigation to establish if there is any conflicts between the PCA and local fire-fighting regulations, or if the BCA could be clarified.

Recommendation 4

That work be undertaken to clarify the requirements for rainwater tanks in bushfire-prone areas, particularly polyethylene tanks, so as to resolve the confusion between building, plumbing and fire authority requirements. This relates to rainwater tanks which are also used as water supplies for fire-fighting, as well as those used for ordinary drinking/non-drinking water supply.

6.2 Material and product standards and certification

(1) A number of submissions called for the current inclusion of rainwater tanks on the WaterMark Exempt Products list to be reviewed, and for AS/NZS 4766 to be referenced in regulation as a way of ensuring the quality and conformance of rainwater tanks in Australia.

(2) It was also noted that current requirements, such as the application of AS/NZS 4020 where materials and products are in contact with water intended for drinking were not being complied with or enforced.

(3) On the basis of the above, as well as earlier conclusions on the clarification of the status of rainwater in the PCA there is a case for reviewing whether rainwater tanks should be subject to mandatory product certification and authorisation. However, at this stage it is considered appropriate that other changes recommended by this report first be given time to be assessed for their impact on compliance with material and product standards.

(4) Given that water tanks are currently exempt from the WaterMark Scheme and are subject to differing approaches to rainwater capture and use nationally, it would be prudent to transition any change to the status of water tanks, should one occur, at a pace acceptable to the various industry sectors that may be affected.

(5) It should also be noted that, since the closing of submission on the Consultation Paper, the Part A2 of PCA has been amended to clarify the evidence of fitness for purpose required for WaterMark Exempt Products, such as rainwater tanks.

6.3 Design considerations and guidance material

(1) Handbook (HB) 230, the Rainwater Tank Design and Installation Handbook was originally produced in 2006 and last updated in 2008; and is now almost eight years old. It covers regulatory and administrative, as well as technical aspects of rainwater tank design and installation. Nonetheless, stakeholders confirmed that HB 230 is used extensively as guidance.

(2) The Consultation Paper suggested that technical aspects of the handbook remained valid but that the regulatory and administrative content had become outdated. Submissions to this report have suggested that the technical content also requires review.

(3) The need for further development of technical guidance was also evidenced by the extensive comments received which addressed system design issues, such as tank sizing and yield calculations.

(4) Given the volume of content that would need to be replaced in HB 230, the amount of additional work required, and the need to maintain a close link to the content of the PCA, it is suggested that as an alternative, an ABCB Handbook could be developed. This would specifically reflect PCA content, promote the national approach, and could also be updated in real-time to keep pace with changes to the PCA and WaterMark.

(5) Such an approach would provide a means of responding to the various submissions received on technical issues not currently captured, in a non-regulatory manner, and would have the advantage of being freely available online. This would likely increase its uptake as well as the awareness and use of the PCA (also free online).

(6) An ABCB Handbook on rainwater harvesting installations could be developed through a PCC working group-style process, with technical content being derived from a number of sources. Submissions to this report have suggested a wide variety of further technical content in addition to the Handbook which they consider would be useful and which should be explored further.

Recommendation 5

That an ABCB non-mandatory handbook be developed to provide guidance on the current regulatory requirements and technical design considerations for rainwater harvesting systems. The content should be developed through detailed consultation with the PCC (and BCC where appropriate), and can be derived from the vast range of sources provided to this report. The new handbook would be intended to be made freely available by the ABCB.

Acronyms

The following acronyms appear in this report:

ABCB, means the Australian Building Codes Board.

above n, followed by a number, is used in the footnotes to direct the reader to an earlier footnote, generally for the purpose of locating the full details of a source cited.

ABS, means Australian Bureau of Statistics.

ACT, means the Australian Capital Territory.

ARMA, means the Association of Rotational Moulders Australasia.

AS/NZS 3500, means Australian / New Zealand Standard 3500: 2015 Plumbing and Drainage. Where a specific Part is referred to, these are: Part 0 [2003] Glossary of Terms; Part 1 Water Services; Part 2 Sanitary Plumbing and Drainage; Part 3 Stormwater Drainage; Part 4 Heated Water Services; and Part 5 [2012] Housing Installations.

BASIX, means the Building Sustainability Index (NSW).

BCA, means the Building Code of Australia, which is Volumes One and Two of the NCC.

BCC, means the Building Codes Committee.

COAG, means the Council of Australian Governments.

Consultation Paper, means the *Plumbing Code Development Research Report Rainwater Harvesting and Re-use – Consultation Paper 2015*, published in June 2015 by the ABCB.

HB 230, means *HB 230: 2008 Rainwater Tank Design and Installation Handbook*.

HIA, means the Housing Industry Association.

Ibid., used in the footnotes, means 'in the same place' (from *'ibidem'*). It is used to refer to a source cited in the footnote above.

MPAQ, means the Master Plumbers Association of Queensland.

MPGAWA, means the Master Plumbers and Gasfitters Association Western Australia.

MPMSAA, means Master Plumbers and Mechanical Services Association of Australia.

NCC, means the National Construction Code Series., as published by the ABCB.

NSW, means New South Wales.

NT, means the Northern Territory.

NUO, means Network Utility Operator(s). This term refers to water entities who undertake the distribution of drinking water or non-drinking water to multiple properties via a water reticulation network. They are sometimes referred to as water entities. Depending on relevant legislation in each State and Territory, a NUO or water entity may be wholly or partially publicly or privately owned.

QDC, means the Queensland Development Code (see *Building Act 1975* (Qld)).

Qld, means Queensland.

PCA, means the Plumbing Code of Australia, which is Volume Three of the NCC.

PCC, means the Plumbing Code Committee.

RHAA, means Rainwater Harvesting Association of Australia (formerly known as the Australian Rainwater Industry Group).

SA, means South Australia.

Sub. / Subs., used in the footnotes and followed by a name (e.g. "*Sub.* Victorian Building Authority"*)*, means 'Submission by' / 'Submissions by'.

Tas, means Tasmania.

VBA, means the Victorian Building Authority.

Vic, means Victoria.

WA, means Western Australia.

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—— *National Construction Code 2016 Volume Two – Building Code of Australia Class 1 and 10 Buildings (Housing Provisions).*

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Appendix I. List of submissions

Submissions to the 2015 Consultation Paper which preceded this report were received from the following (listed in order or receipt):

- Micah Pendergast (individual)
- Martin Clark (individual)
- Rod Johnston (individual)
- Dr. Ashok Sharma (individual)
- Master Plumbers Association of Queensland
- City West Water (Victoria)
- Association of Rotational Moulders Australasia
- Housing Industry Association
- Master Plumbers and Gasfitters Association Western Australia
- Rainwater Harvesting Association of Australia
- Sunshine Coast Regional Council (Queensland)
- One Water Naturally Pty Ltd
- Aquatrek
- Queensland Government (Department of Health; Queensland Building & Construction Commission; Department of Housing and Public Works)
- Victorian Building Authority

Appendix II. Summary of State/Territory water conservation policies

(A) Building in a separated rainwater supply service – ACT

In the ACT, although it is not mandatory to install a rainwater tank, for single residential buildings and associated garages, rainwater piping and supply points must be built in to enable future use of rainwater. These supply points must be adjacent to the first water closet cistern tap, and the first washing machine cold water tap. An external point must also be included for connection of the rainwater tank. These requirements are mandatory for houses which have access to the reticulated water supply and voluntary for multi-unit developments (3 units or more).[57]

(B) Water use reduction targets in BASIX – NSW

In New South Wales, new buildings must meet sustainability obligations which are defined under the Building Sustainability Index (BASIX).[58] These sustainability obligations include a mandatory water reduction target of between 0 and 40% for residential developments, depending on climatic zone. The 40% reduction target applies to 90% of new developments, and to 98% of "high growth areas".[59]

Under BASIX, rainwater tanks are not mandatory but are recognised as an acceptable form of alternative water supply, based on the catchment area and tank capacity relative to the use of water and any diversion of tank overflow (i.e. to another tank). The water may be used for any purpose, although NSW Health does not recommend drinking tank water where a reticulated drinking water supply is available.[60] There are no specific installation or tank certification requirements or Standards called up under BASIX, however it is stated that rainwater must not be captured from trafficable areas.[61]

[57] *Water and Sewerage Regulation 2001* (ACT) r 24A.

[58] *Environmental Planning and Assessment Act 1979* (NSW) s 80A; *Environmental Planning and Assessment Regulation 2000* (NSW) r 97A; *State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004* (NSW).

[59] Department of Planning and Environment (NSW). *About BASIX,* and *BASIX Help Notes,* Online: www.basix.nsw.gov.au (accessed 22/7/14). The term 'climatic zone' is determined by BASIX and is not the same as the term 'climate zone', used in the NCC.

[60] NSW Health. *Rainwater Tanks Where a Public Water Supply is Available – Use of,* Guideline no. GL2007_009, 6 June 2007.

[61] *About BASIX,* and *BASIX Help Notes,* above n 79.

(C) Supplementary water sources – QLD

In Queensland, under the *Queensland Development Code* (QDC), a Local Government may apply to the Minister for Housing and Public Works to opt-in to mandatory requirements for rainwater tanks for new buildings in areas with a reticulated water supply. This applies to both residential and commercial buildings.[62] The QDC is made under the *Building Act 1975* (Qld).[63]

As at 25 August 2015, two Local Governments have opted-in to mandate rainwater tanks for new buildings in their jurisdictions:[64]

- Toowoomba Regional Council (approved 1 September 2014) for both MP 4.2 (only for Class 1a(i) buildings on properties over 250 square metres in lot area — i.e. excludes small lots) and MP 4.3 (only for Classes 5 to 9 buildings, but excluding Class 3 buildings and Class 4 parts of buildings).

- Gold Coast City Council – Pimpana-Coomera part area (approved 5 June 2015) for both MP4.2 and MP 4.3.

The following technical provisions for rainwater tank installations also appear in the QDC. They apply in all Local Government areas, including those where the Council has not opted-in to require the installation of rainwater tanks for new buildings.

- Rainwater tanks must have a minimum of the first 20 litres of water from the catchment discarded before any water enters the tank ('first flush diversion'); and for a tank supplied by a wet system,[65] have a screened rainhead installed for each downpipe connected to the tank.

- The tank overflow must be connected to the stormwater system, or approved on-site system, with piping complying to AS/NZS 3500: 2003 and with a physical air-break or non-return valve installed at the outlet of the tank.

- Tank materials must comply with specified Standards (mostly Australian Standards).

- Tank openings must be watertight to prevent stormwater or surface water entering the tank, or if non-watertight lids are used, then the opening must terminate a minimum of 150 mm above finished surface level.

[62] *Queensland Development Code Mandatory Part 4.2: Rainwater tanks and other supplementary water supply systems*, and *Mandatory Part 4.3: Supplementary water sources – commercial buildings*, both Version 2.0. 2013.

[63] *Building Act 1975* (Qld) s 13.

[64] *Sub.* Queensland Government.

[65] A 'wet system' in the QDC means a system which uses hydraulic head pressure to force water up a vertical riser pipe into the tank, and which consistently holds water.

- Signage must be attached, of a minimum size 450 x 250 mm (length x width) with the words "WARNING: RAINWATER" in capital letters at least 25 mm high.

(D) Water efficiency additions to NCC Volume Two (Housing) – SA

SA includes an additional Performance Requirement for water efficiency included in their Appendix to NCC Volume Two. The stated Objective is 'to efficiently use all available water supplies'. According to the Functional Statement, this may be achieved by reducing the amount of water required from the 'mains reticulated supply'. The corresponding Performance Requirement is to provide an additional supply other than the mains, and which is plumbed to at least a water closet, water heater, or the laundry outlets.[66]

The Acceptable Construction Practice requires that surface water runoff from a roof catchment area is collected by a drainage system complying with clauses 3.5.1 and 3.5.2; is stored in a rainwater tank of at least 1,000 litres capacity; and is plumbed to at least a water closet, water heater, or all laundry cold water outlets. Overflow must comply with either clause 3.1.2 or local requirements.[67]

The rainwater tank must be fitted with non-degradable, mosquito-proof screens, and where supported on a stand, the stand must comply with clause 3.11.2 of NCC Volume Two.[68]

(E) Building sustainability requirements – VIC

Within NCC Volume Two, which forms part of the Victorian Building Regulations,[69] a variation to the energy efficiency requirements provides that they may be met by installing either a solar water heater, or a rainwater tank, in accordance with the *Plumbing Regulations 2008* (Vic).

(F) Rainwater used for sanitary flushing – VIC

Under the *Plumbing Regulations 2008* (Vic), where a rainwater supply is used for sanitary flushing, and a NUO supply is also connected to the building, an automatic or manual changeover device must be provided between the two so as to ensure continuity of supply.[70]

[66] *NCC 2015 Volume Two*, above n 33, cl SA 2 [Water Efficiency]. This addition does not apply in the Local Government areas of the Municipal Council of Roxby Downs or the District Council of Coober Pedy.

[67] *Ibid.* cll SA 2.2.2, SA 2.2.3.

[68] *Ibid.* cll SA 2.2.4, SA 2.2.5.

[69] *Building Regulations 2006* (Vic) r 109.

[70] *Plumbing Regulations 2008* (Vic) sch 2, pt 7, cl 14(1).

Rainwater tanks installed in order to comply with the Building Regulations (discussed above) must have a minimum catchment area of 50 sq. m, a minimum capacity of 2,000 litres, and be plumbed to all toilets in the building.[71]

[71] *Ibid.* sch 2, pt 7, cl 14(2).

Appendix III. Summary of relevant State and Territory legislation

Building and plumbing, generally, are regulated under the relevant State and Territory 'building' and 'plumbing and drainage' legislation. Rainwater harvesting is captured under both building and plumbing legislation, to varying extents, in each State and Territory. Under most State and Territory building legislation, there are provisions which affect the application of building regulations (including the BCA) to rainwater tanks. Under plumbing legislation, similar provisions also exist in relation to the application of the PCA to the plumbing from the rainwater tank to connected fixtures.

A summary of the State and Territory legislation referred to above, relevant to rainwater harvesting and use, is provided in this Appendix. It provides general information only and is not intended as legal advice. For the latest version of any Act or Regulation described below, please contact the State/Territory Government Publisher.

(A) Australian Capital Territory

Building Act 2004

Provides for the regulation of buildings and building work, as defined under the Act; also provides for the exemption, by regulation, of certain works from application of the Act.[72]

Building (General) Regulation 2008

Adopts the BCA, although an exemption applies for water tanks having a capacity not greater than 20 kilolitres, where the height of the tank is not greater than 2.4m (excluding any below ground portion of the tank).[73]

Water and Sewerage Act 2000

Makes provisions in relation to the supply of plumbing or sanitary drainage services and adopts the PCA.[74] Plumbing includes work on a water service, which "means the part of the water supply pipework used, or for use, for water supply from a primary water source up to and including outlet valves at fixtures and water appliances".[75]

If plumbing work is "from a primary water source…" (emphasis added), then potentially it does not include that primary water source (e.g. a rainwater tank which is the only water supply),

[72] *Building Act 2004* (ACT) Long Title; s 136.

[73] *Building (General) Regulation 2008* (ACT) r 6; sch 1, pt 1.3, item 20.

[74] *Water and Sewerage Act 2000* (ACT) Long Title; s 44C.

[75] *Ibid.* Dictionary.

however it may include any in-line secondary water sources thereafter (e.g. rainwater tanks used for supplementary water supply).

Water and Sewerage Regulation 2001

Requires that work on a water service taking its water from a water network must comply with the PCA.[76] There is no similar requirement for works on water services that take their water only from a rainwater supply (consistent with the definition of plumbing work in the Act). Additionally, it is also required that provision be made in certain buildings for the connection, in future, of a separate rainwater supply.[77]

(B) New South Wales

Environmental Planning and Assessment Act 1979

This Act sets out the requirements for buildings to be approved in accordance with the BCA.[78] Rainwater tanks however are considered an exempt development, and as such different requirements are applicable.[79]

State Environmental Planning Policy (Exempt and Complying Development Codes) 2008

Provides the design and technical requirements that rainwater tanks must meet to be considered Exempt Development for the purposes of the *Environmental Planning and Assessment Act 1979*.

Under these codes,[80] for rainwater tanks to be considered an 'exempt development' — for which development consent would not be required,[81] — the following requirements apply (summarised):

Part 1 – General

- *Compliance with the DtS Provisions of the BCA.*
- *Installation in accordance with the manufacturer's specifications.*
- *Must not include any pruning or vegetation removal that would itself require a permit.*

[76] *Water and Sewerage Regulation 2001* (ACT) r 18.

[77] *Ibid.* rr 24A, 24B.

[78] *Environmental Planning and Assessment Act 1979* (NSW) esp. ss 4, 79C.

[79] *Ibid.* s 76.

[80] *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* (NSW) subdivs 32, 33.

[81] *Environmental Planning and Assessment Act 1979* (NSW) s 76(2).

Subdivision 32 Rainwater tanks (above ground)

- *For an educational establishment, maximum tank capacity is 25,000 litres; for all other sites it is 10,000 litres.*[82]
- *Minimum setback of at least 450 mm from each lot boundary,*[83] *behind the building line at any road frontage.*
- *Tanks are not to rest on the footings of existing buildings for support.*
- *Required cut and fill to be not greater than 1 metre below or above existing ground level.*
- *A first-flush device must be fitted.*
- *A sign must be fixed to the tank stating that it contains rainwater.*
- *The tank must be constructed to prevent mosquito breeding.*
- *The overflow must be connected to a stormwater drainage system that does not discharge to adjoining property, nor cause nuisance to adjoining owners.*
- *Location at least 1 m from any registered easement, water main or sewer main.*
- *If constructed or installed on or in, or in relation to, a heritage item or a draft heritage item, located in the rear yard.*
- *Pumps must be in a soundproof enclosure.*
- *If reticulated water is provided to the lot, there is to be no interconnection with the reticulated water supply, unless made in accordance with the water authority's requirements.*

Subdivision 33 Rainwater tanks (below ground)

On land that is generally used for agricultural/rural purposes (RU1, RU2, RU3 and RU4 zones) a below ground rainwater tank may also be an exempt development, if it complies with conditions the same as listed at subdivision 32 (to the extent they are relevant to below ground installations).

[82] Except on land zoned as RU1, RU2, RU3 or RU4 which is, generally, land used for rural and/or agricultural purposes.

[83] This distance becomes 10 m in RU1, RU2, RU3 or RU4 zones.

Environmental Planning and Assessment Regulation 2000

The regulation adopts, for the purposes of the Act, the NCC (to the extent of the Building Code of Australia), and requires any 'building work' (not specifically defined) to comply with the BCA and the *Home Building Act 1989*.[84] These provisions may apply to rainwater tanks that, for whatever reason, are not exempt development. The regulation also deals with the application of the BASIX scheme, under which rainwater tanks are a compliance option.

Local Government Act 1993

Under this Act, Council approval is required for certain activities related to rainwater harvesting and use, particularly stormwater drainage work.[85]

Local Government (General) Regulation 2005

The regulation applies the PCA and the requirements of the relevant Council (under a SEPP or as otherwise directed) to stormwater drainage work.[86] Furthermore, any other water supply work that is not 'plumbing and drainage work' within the meaning of the *Plumbing and Drainage Act 2011* (NSW) must also comply with the PCA.[87] This would likely capture rainwater harvesting as from the catchment area (roof), its conveyance into the storage tank, the storage tank itself, and its connection to the plumbing work that is then covered by the *Plumbing and Drainage Act 2011* (NSW).

Plumbing and Drainage Act 2011

This Act relevantly defines 'plumbing and drainage work' as being—

> *"the construction of, or work on, a plumbing installation that connects, directly or indirectly, with a network utility operator's water supply system, downstream from the point of connection to a network utility operator's water supply system; or*
>
> *the construction of, or work on, a plumbing installation that connects, directly or indirectly, with any other water supply system, if the construction or work is residential building work within the meaning of the Home Building Act 1989".*[88]

The *Plumbing and Drainage Regulation 2012*, as made under this Act, deals with administrative matters only.

[84] *Environmental Planning and Assessment Regulation 2000* (NSW) rr 7, 98.

[85] *Local Government Act 1993* (NSW) s 68.

[86] *Local Government (General) Regulation 2005* (NSW) rr 16A, 21.

[87] *Ibid.* r 16; sch 1, pt 2.

[88] *Plumbing and Drainage Act 2011* (NSW) s 4.

(C) Northern Territory

Building Act

The Building Act applies to 'building work', which is defined as work for or in connection with the construction, demolition or removal of a building; or plumbing or drainage services, whether or not connected to a building.[89]

Building Regulations

The Building Regulations adopt the NCC, and apply it to building work (defined in the Act) on any building that can be classified according to use under Part A3.2 of the BCA.[90] The regulations contain no specific provisions or limitations regarding rainwater harvesting and re-use; as such they could be taken to be applicable to the extent that such work is building work. To the same extent, the NCC would apply to any part of that work.

(D) Queensland

Building Act 1975

This Act regulates building work, building classifications etc. and enables the operation of both the Queensland Development Code (QDC) and the NCC (to the extent of the BCA) in Queensland.[91] Under its provisions, rainwater tanks must comply with the QDC and the BCA.[92] They can be considered self-assessable development provided they are within limits prescribed in the regulations, and are installed in accordance with the relevant acceptable solutions of the QDC and (if applicable) the BCA, otherwise a development application may be required.[93]

Building Regulation 2006

Under the regulations, a rainwater tank for a new building is not 'prescribed'[94] as self-assessable development, so it would be assessed as part of the new building proposal.

[89] *Building Act* (NT) ss 4, 49. Plumbing and drainage services excludes those vested under the *Power and Water Corporation Act.*

[90] *Building Regulations* (NT) r 4(1). The classification system referred to (BCA Part A3.2) is also replicated in Part A4.2 of the PCA.

[91] *Building Act 1975* (Qld) Long Title, ss 5, 12, 13.

[92] *Ibid.* s 30.

[93] *Ibid.* s 21. The wording is 'may' be required, not 'will' be required, as the rainwater tank may for other reasons be considered to be exempt development under the Act.

[94] For the definition of 'prescribed' building work, see *Building Regulation 2006* (Qld) r 4.

For an existing building however, a rainwater tank is considered a self-assessable Class 10b structure if it is not higher than 2.4m, nor wider than 5m, with a plan area not greater than 10 square metres.[95]

For the purposes of this part of the regulation, a rainwater tank is defined as 'a covered tank used to collect rainwater from a building, and any stand that supports the tank'.[96]

In either case, this may not include the rainwater supply itself if that supply is upstream of a point of connection, or if the building is not residential. The Act then requires plumbing and drainage works as above to comply with the PCA.[97]

Plumbing and Drainage Act 2002

This Act regulates plumbing, which it relevantly defined as 'for water — an apparatus, fitting or pipe for supplying water to premises from a service provider's infrastructure or a water storage tank and for carrying water within premises'.[98] Plumbing from a catchment to a water storage tank is not mentioned.[99] Regulations, called the 'Standard Plumbing and Drainage Regulation' may be made under this Act to regulate plumbing work, and define the scope of the compliance assessable, notifiable, and minor work categories.[100]

Standard Plumbing and Drainage Regulation 2003

This regulation adopts the PCA and the Queensland Plumbing and Wastewater Code (QPW Code) jointly, with the latter overruling in the event of conflict.[101] In addition, QDC MP 4.2 and 4.3 are also adopted,[102] and Local Government approval is required for connection of a top-up supply to the tank.[103] Plumbing from a rainwater tank is either compliance assessable or notifiable

[95] *Building Regulation 2006* (Qld) sch 1, cl 13.

[96] *Ibid.*

[97] *Ibid.* s 7.

[98] *Plumbing and Drainage Act 2002* (Qld) sch. (emphasis added).

[99] This would be consistent with Part D1 of the PCA, which deals with roof drainage systems, but is disapplied by the Queensland Appendix to the PCA (emphasis added).

[100] *Plumbing and Drainage Act 2002* (Qld) s 145. Definitions of 'compliance assessable' etc are in the Dictionary of the Act, which refers back to the Regulations.

[101] *Standard Plumbing and Drainage Regulation 2003* (Qld) rr 8A, 8B, 8C.

[102] *Ibid.* r 9, sch 1. MP 4.2 deals with Rainwater tanks and other supplementary water supplies for dwellings; MP 4.3 is similar, and applies to commercial buildings.

[103] *Ibid.* r 45.

depending on if it relates to a new or existing building or water service,[104] with the exception of installing or replacing an automatic switching device, which is minor work.[105]

(E) South Australia

Development Act 1993

Provides for the regulation of development and building standards, and adopts the BCA. It also provides the making of Building Rules outside the BCA which are made by regulation (discussed below).[106]

Development Regulations 1993

These Regulations adopt the BCA and set the Building Rules. Rainwater tanks are considered 'complying development' (i.e. complying with the 'Building Rules') if they are not greater than 10 square metres in area; not greater than 4 m high; are located wholly above ground; and are part of a roof drainage system.[107]

Otherwise, a water tank does require development consent if —

- where it is (wholly) above-ground, it is part of a roof drainage system; has a floor area not exceeding 15 square metres; is not higher than 4 m; will not front the building line of the building it serves; and if made of metal, is non-reflective; and

- where it is under-ground, it ancillary to a dwelling on the same site; and is located wholly below ground (including any required pumps).[108]

Water Industry Act 2012

This Act has a broader application than the 'Plumbing Acts' of other jurisdictions in that it provides a definition of water, which includes rainwater.[109] This brings rainwater within the definitions of

[104] *Ibid.* sch 2, cl 2 (which covers existing services/buildings). 'Compliance assessable' work is defined in the Act as any work not otherwise defined as 'notifiable' or 'minor'.

[105] *Ibid.* sch 3, cl 9.

[106] *Development Act 1993* (SA) Long Title; ss 4, 108.

[107] *Development Regulation 2008* (SA) r 8A; sch 4, pt 2, cl 14(1)(e). This does not apply in certain heritage areas specified under the Regulation.

[108] *Ibid.* r 5AA; sch 1A, cll 8-9.

[109] *Water Industry Act 2012* (SA) s 4.

'water service' and 'water plumbing'; terms that are used to define the works to which relevant parts of the Act apply.[110]

The Technical Regulator is empowered to make standards in relation to, among other things, water plumbing including 'plumbing work or any equipment, products or materials used in connection with plumbing'; and such standards may adopt codes such as the PCA.[111]

Plumbing Standard 2012

The *Plumbing Standard 2012*, issued by the Technical Regulator, requires plumbing work within the meaning of the *Water Industry Act 2012* to comply with the PCA (exc. Part A4 and Sections D and E).[112] Because rainwater is included in the definition of plumbing under the Act, the PCA applies to rainwater systems (except roof drainage components covered by Section D), regardless of whether they are used for drinking or non-drinking water supply.

The *Water Industry Regulations 2012* do not make any specific provisions in relation to rainwater harvesting systems and associated plumbing requirements.

(F) Tasmania

Building Act 2000

Under this Act, which covers both building and plumbing matters, 'plumbing installation' is relevantly defined as including 'a system of water supply…a system of stormwater drainage, [or] roof drainage'.[113] The Act adopts the NCC in full (i.e. BCA and PCA).[114] This would substantially enable it to capture a rainwater harvesting system, including in relation to the roof catchment, roof drainage, water storage and associated plumbing and drainage, whether or not the water is to be used for drinking.

Building work and plumbing work must be carried out under a building permit, or plumbing permit/special plumbing permit, respectively, unless an exemption exists under the Regulations.[115]

[110] *Ibid.* Water Service means 'a service constituted by the collection, storage, production, treatment, conveyance, reticulation or supply of water' and Water Plumbing means 'the installation, alteration, repair, maintenance or disconnection of pipes or equipment (including water heaters) to be connected directly or indirectly to a water supply system'.

[111] *Ibid.* ss 66, 67.

[112] *Plumbing Standard 2012* (SA) cl (a).

[113] *Building Act 2000* (Tas) Long Title; s 3(1).

[114] *Ibid.* ss 55, 57, 58.

[115] *Ibid.* ss 60, 75.

Building Regulations 2014

Under these regulations, a water tank does not require a building permit if it is not more than 1.2 m high.[116] However, this exemption does not displace any requirement to comply with the BCA, and cannot be applied where the tank is associated with the construction of a building for which a permit would be required (e.g. a new house).[117]

Plumbing Regulations 2014

The Plumbing Regulations specify that plumbing installations must comply with the PCA.[118] There are no specific regulations or exemptions applicable to rainwater harvesting systems. Of course, this depends on if the rainwater harvesting system is a plumbing installation for the purposes of the PCA.

(G) Victoria

Building Act 1993

This Act sets out to regulate both building and plumbing work,[119] and so may capture both of those aspects of rainwater harvesting and use. It provides for the adoption of the BCA under the 'building' regulations,[120] and the PCA under the plumbing regulations.[121]

Building Regulations 2006

These Regulations adopt the BCA.[122] The regulations do not make any specific technical provisions in relation to rainwater harvesting, although a 500mm concession applies to the boundary setback for domestic water tanks.[123] Also, where a rainwater tank is a water supply for fire-fighting, on a site affected by the 2009 Black Saturday bushfires, it will need to meet certain minimum capacity and related provisions.[124]

[116] *Building Regulations 2014* (Tas) r 4.

[117] *Ibid.* r 5.

[118] *Plumbing Regulations 2014* (Tas) r 30.

[119] *Building Act 1993* (Vic) s 1.

[120] *Ibid.* s 9(1).

[121] *Ibid.* ss 221ZZZV, 221ZZZW.

[122] *Building Regulations 2006* (Vic) r 109.

[123] *Ibid.* r 414.

[124] *Ibid.* r 808.

Plumbing Regulations 2008

These regulations adopt the PCA.[125] Rainwater systems fall under 'water supply work' which also includes cold water, heated water and non-drinking water service work.[126] The regulations apply the PCA to this work, with the following modification:

> *The PCA is modified to the extent that AS/NZS 3500.1, as incorporated by the PCA, is to be read as if there were substituted for Clause 9.5.2.3(d)—*
>
> *"(d) They shall have a non-standard inlet connecting thread and a standard hose connection outlet."* [127]

(H) Western Australia

Building Act 2011

This Act sets standards for the construction of buildings and incidental structures, and may by regulation prescribe applicable building standards. These standards may include references to published documents such as the NCC.[128]

Building Regulation 2012

These regulations apply the BCA as the applicable building standard for all kinds of buildings and "incidental structures".[129] The term 'incidental structure' is not defined in the Act or the Regulations, but may potentially capture structures such as rainwater tanks appurtenant to (i.e. incidental to) a building.

Plumbers Licensing Act 1995

This Act provides for, among other things, the adoption of the PCA and the 'specification' of plumbing work to which it applies. Therefore it does not make any specific provision as to rainwater harvesting, but may capture it by regulation.[130]

Plumbers Licensing and Plumbing Standards Regulations 2000

The Regulations define 'specified' plumbing work as including water supply plumbing work, but only in relation to potable water supplied from a NUO water supply, not rainwater or non-drinking

[125] *Plumbing Regulations 2008* (Vic) r 7 (and subject to rr 8-9).

[126] *Ibid.* r 34.

[127] *Ibid.* r 35, and as modified at: sch 2, pt 7, cl 16.

[128] *Building Act 2011* (WA) Long Title; ss 37, 149-50.

[129] *Building Regulations 2012* (WA) r 31A.

[130] *Plumbers Licensing Act 1995* (WA) ss 59L, 61.

water.[131] The PCA is adopted as part of the regulations, but only to the extent it relates to the 'plumbing work' described above. This limits the application of the PCA to rainwater harvesting systems in WA, regardless of whether or not the rainwater is used for drinking or non-drinking purposes.[132]

[131] *Plumbers Licensing and Plumbing Standards Regulations 2000* (WA) r 4.

[132] *Ibid.* r 48.

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Australian Building Codes Board
GPO Box 9839
Canberra ACT 2601
www.abcb.gov.au