PRELIMINARY IMPACT ANALYSIS

PROPOSAL:

This proposal seeks to review Joint Australian New Zealand Standard (AS/NZS) 3500, *Plumbing and drainage Part 2: Sanitary plumbing and drainage* to amend the requirements for connecting of drains installed at grade.

Responsible Technical committee: Australian Standard Committee WS-014, *Plumbing and Drainage*

NCC REFERENCE: For revisions or amendments to existing National Construction Code (NCC) referenced documents, provide additional information	**BCA Volume One:** N/A **BCA Volume Two:** N/A **PCA Volume Three:** C1.3, CV2.3, C2.3 and C2.4
PROPONENT:	Nominating organisation: AIG Nominating individual: Dr Steve Cummings Position: Director Innovation Contact email: SCummings@gwagroup.com.au
DATE OF PIA: To differentiate between versions include the document date and/or version number	Date: 4 May 2020 Version: 6 Status: DRAFT

NATURE AND EXTENT OF THE PROBLEM:

In 2008 ASFlow was formed in response to numerous sanitary plumbing and drainage blockages. ASFlow was a working group comprised of members from State and Territory Plumbing Regulators and industry representatives to study the impact of reduced flows from plumbing fixtures and their effect on sanitary drainage performance.

Sanitary plumbing and drainage blockages cause fixtures to be inoperable with significant inconvenience for users in both domestic and commercial buildings with clearance and rectification of the blockages often being extremely expensive.

From ASFlow information, Sydney Water estimated that approximately 4,000 blockages or sewer chokes per year can be referred to private sewers. In Melbourne, Yarra Valley Water has estimated that the cost to clear blockages within their network was in the range of $1m per year. It is reasonable to expect that the number of blockages experience by other Water Utilities across Australia and New Zealand will make the number of estimated blockages and costs significantly higher.

Information gathered from plumbing practitioners through the Master Plumbers Association (MPA) Australia confirmed that there is little evidence available on the cause of sanitary plumbing and drainage blockages apart from the more obvious causes such as broken pipes and tree routes which are able to be physically observed through inspections with the use of drain cameras. The MPA have stated that the loss of water was considered to be a significant contributing factor.

However, a leading plumbing practitioner has experienced blockages in a drainage networks using 45degree junctions in a high profile commercial building where in one a month period 14 blockages were reported that required clearing. A CTV image building below shows a blockage at the junction.

This image shows waste stranding in the branch of a 45 degree junction.

It was also reported by numerous plumbing practitioners that issues have been identified where floor waste gullies taking in soil wastewater caused from effluent entering the branch lines and flowing into gullies. This observation supported the position that water is being lost through each junction off the main drain line. This particular aspect of the issue is discussed in greater detail below.

There was a clear need for investigative research into the cause of these issues to develop informed solutions to prevent waste stranding, blockages and soil wastewater entering gullies. This research was undertaken using a replication approach utilising transparent pipework where drainage systems where issues have been identified can be replicated, simulated and observed.

A domestic installation in Western Australia was chosen to as the case study to be replicated as sanitary drainage blockages were regularly occurring, water efficient fixtures were utilised and the installation was compliant with the Plumbing Code of Australia (PCA) and AS/NZS 3500.2.
In the installation included a 4.5/3L toilet which was installed upstream of four other fixtures connected to the drain using 45-degree junctions installed on grade. The branch length was 31 metres to the main household drain.

To investigate the issue, the installation was replicated using DN100 clear pipework at the Canberra Institute of Technology (CIT) in accordance with the PCA and AS/NZS 3500.2. This testing apparatus was accredited by the National Association of Testing Authorities (NATA) as an accredited testing apparatus.

The test rig was set up to replicate the WA domestic installation layout with a 1 in 60 fall i.e. 1.67º using four standard 45º waste plumbing DN 100 junctions and clear drainage pipework within an existing area within the CIT. The following drainage configurations on the rig were tested:

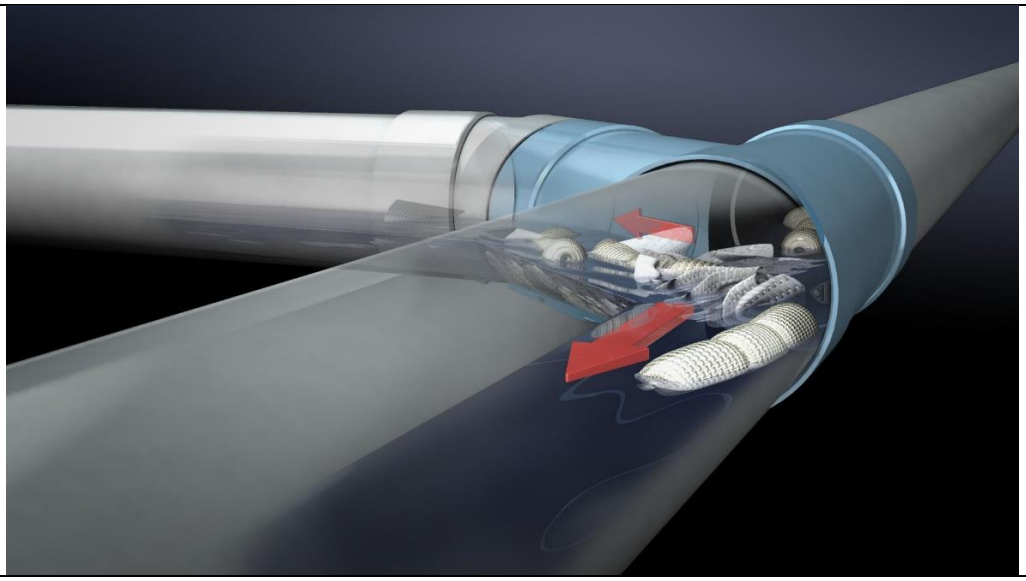
- Standard Horizontal 45º Sweep Junctions – WA domestic installation layout at 1.67 degrees
- Standard Horizontal 45º Sweep Junctions – Turned up at 90 degrees
- Standard Horizontal 45º Sweep Junctions – 15 degrees from the horizontal re DIN 1986
- Standard Horizontal 45º Sweep Junctions – Junction volume loss with branch lines disconnected
- New horizontal Sweep Junction prototype concept only

The test methodology used for the above rig configurations involved the testing of a 4.5/3L toilet as in in the Western Australian installation followed applicable AS1172.1&2 test procedures. For comparison purposes other flush volumes were also tested. The test media was combined to replicate actual usage conditions for each test as follows:

- Four artificial test media solids made to the Australian Standard AS1172.1-2005 Appendix C and four crumble balls consisting of 7 adjoining sheets of single ply tissue toilet paper
- Four artificial test media solids made to the UNAR Guidelines and Specifications -2006 for Toilet fixtures and four crumble balls consisting of 7 adjoining sheets of single ply tissue toilet paper
- Four crumble balls consisting of 7 adjoining sheets of single ply tissue toilet paper

The image above shows the waste blockage/stranding at the 45 degree junction and up into the branch line in the standard test configuration

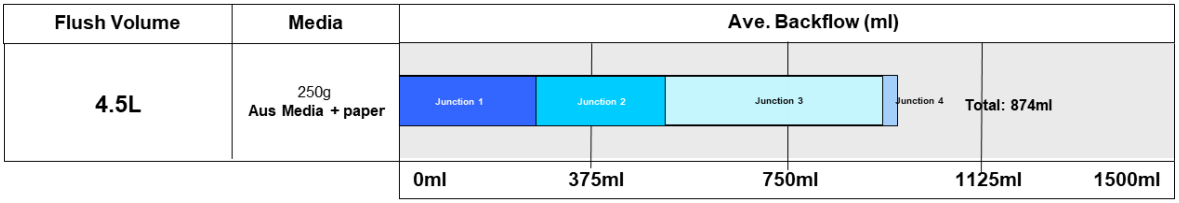
Test results showed the 4.5L full flush discharge from the toilets performance was adversely affected by each 45-degree junction. During a full flush discharge, the water was found to travel up each of the four branch lines significantly reducing the flush volume carrying the waste test media, stranding the solids and paper. Standing was also observed within the 45-degree junction caused by the redirection of the flow of the waste from the junction, refer to the link and images below.



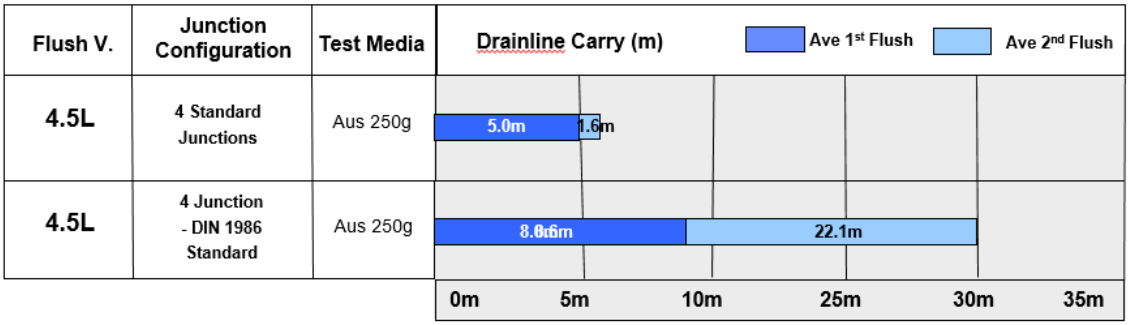
The graphic image above shows the redirection of the flush discharge and waste as it travels down the drain line and into the 45 degree junction connection area

Video of the testing can be obtained here.
https://www.dropbox.com/s/rdjxz5j7zgf8gcz/MVI_2409.wmv?dl=0
https://www.dropbox.com/s/tgpp0pwee879mar/MVI_2353.wmv?dl=0

Testing showed that the wastewater flowed through each of the 45-degree junctions into the branch lines. Results were measured from each junction and the water loss totalled 874 ml or a 19% loss of the original 4.5L full flush volume discharged from the Water Closet.



The average sanitary drainage transportation distance of solid and paper test media achieved was 5 metres after a single flush and 6 metres after two flush discharges (see below results).



To determine an appropriate solution, a number of alternative 45-degree junction configuration were tested. One possible solution that was tested was a configuration utilized by the German Standard, DIN 1986. DIN 1986 requires 45-degree junctions to be installed at a minimum of 15 degrees inclination when connecting a main drain to a branch drain.
This configuration was evaluated through physical testing and observations found this to provide the best performance of all alternative configurations tested. The configuration resolved all issues experienced and the following improvements in performance observed:

- No water was wasted from the 4.5L flush discharge, eliminating the back wash of water into the four branch lines - saving 874ml per flush.
- No standing/blockages of solids and paper was found to occur in any of the junctions or branch lines.
- Transportation performance of waste was increase by 42% for the first flush using the entire flow volume from the 4.5L flush. The transportation performance of second flush volume was also observed to be significantly improved.

Based on the sanitary drainage performance outcomes, Proposal 752 (Junctions in drains) was submitted to Standards Australia to be incorporated into the 2018 revision of AS/NZS 3500.2. The proposal suggested amendments of Clause 4.9.2, Clause 4.9.3 and Figure 4.9.1 to show a 15 degree inclination when a branch drain joined another drain.

Subsequent to the publication of the 2018 edition of AS/NZS 3500.2, it was realised that while the

necessary change had been made to the figure, the corresponding text had not been updated. This issue is causing significant confusion in the industry, where drains were still being laid at grade without the 15-degree inclination of the junction, allowing for drainage performance problems to continue across Australia and New Zealand. To attempt to resolve this issue, some plumbing regulatory authorities and industry associations across Australia are now promoting the inclination of junctions as best practice.

A number of plumbers and drain layers in New Zealand have been reported to already install junctions on an incline as best practice, however not all have been stated to undertake this practice. In New Zealand, no regulatory authorities or industry associations are known to be officially promoting this practice, however the Ministry of Business, Innovation and Employment (MBIA) in New Zealand will be providing some associated guidance in the near future.

Therefore, in the interest of ensuring what is currently considered as best plumbing practice, Standards Australia's WS-014 committee has developed a revised amendment for junctions in sanitary drainage systems, (for Clause 4.9.2 and Clause 6.6.2.4 of AS/NZS 3500.2).

This amendment has been drafted by the Australian and New Zealand plumbing industry, in consultation with State and Territory Plumbing Regulators (through the Australian Building Codes Board) and New Zealand Ministry of Business, Innovation and Employment (MBIE).

All stakeholders consulted agree that this amendment will assist plumbing regulators, designers and practitioners by reducing the risk of misinterpretation of installation specifications and regulatory requirements and ensure that the risks of waste stranding a minimised.

It was also reported by numerous plumbing practitioners that issues have been identified where floor waste gullies taking in soil wastewater (e.g. waste from water closet pans and urinals) caused from wastewater entering the branch lines and flowing into gullies where junctions have been installed on grade without a suitable elevation in the branch connection. Whilst this particular issue of soil wastewater entering gullies has been resolved though amendments to the Plumbing Code of Australia through the introduction of provisions C1.2 and C2.2. This however supports the position that water is being lost through each junction off the main drain line and that this loss of water is considered by plumbing practitioners as a contributing factor to waste stranding.

Another consideration which relates to this issue is water wastage where multiple flushes are required to counteract the water loss through each junction, however as the issue is not widely known to the homeowner, it is considered that this would be minimal.

OBJECTIVES:

The key objective is to overcome drainage performance problems with junctions installed on grade across Australia and New Zealand. A secondary objective is to remove the inconsistencies between the text of Clause 4.9.1 and Clause 6.6.2.4 and Figure 4.9.1 of AS/NZS 3500.2.

OPTIONS:

Option 1 Status quo.
No change to AS/NZS 3500.2

Option 2 Non-regulatory content

Provide informative notes in AS/NZS 3500.2 under Clause 4.9.1 Drains installed at grade and Clause 6.6.2.4 Junctions installed at grade, with recommendations to install junctions with a 15 degree incline. No changes to the mandatory requirements would be made to AS/NZS3500.2.

Option 3 Regulatory revision

Amendment to AS/NZS3500.2 Clauses:
4.9.1 Drains installed at grade; and
6.6.2.4 Junctions installed at grade.

This amendment would include requirements to install 45 degree junctions on grade at with a 15 degree minimum incline.

From initial consultation and valuable input from both representatives from New Zealand and the ABCB's Plumbing Code Committee, the requirements proposed for inclusion will be limited as follows:

1. New installations only.
2. DN 100 drainage pipework and junctions only.
3. Only junctions from the main line.
4. Provisions to apply to both sanitary plumbing and drainage.
5. Informative recommendation for best practice installations to be provided for all other circumstances.

Text of the proposed changes is given in Appendix A.

IMPACT ANALYSIS (OF ALL OPTIONS):

Impact analysis of the identified options is as follows:

Option 1. Status Quo

If no action is taken the current drainage performance problems due to the installation of junctions on grade (described above) will continue across Australia and New Zealand.
In terms of costs and benefits, there will be no cost increases (no change to drain components) but the cost of clearing unnecessary blockages which is estimated at many millions (see above) will continue.

This could see the issues continuing in industry where the installation would be compliant to the requirements of the standard, however not meet the relevant performance requirements of the PCA in that a sanitary drainage system:

- CP2.1 (1) A sanitary drainage system must ensure the following: (a) Sewage is transferred from a sanitary plumbing system to an approved disposal systems.
- CP2.1 (2) A sanitary drainage system must avoid the following: (a) Blockage and uncontrolled discharge.

One of the primary objectives of the PCA are stated to be to safeguard people from loss of amenity and/or property damage due to the failure of a sanitary drainage system. It is considered that this option would see the continuation of the issues raised above occurring and the Deemed-to-Satisfy provisions not adequately meeting the objectives and mandatory Performance Requirements of the PCA.

This option would also see the continued compliant work of plumbing practitioners, whilst building owners are left with the costs associated with rectification.

The confusion within industry caused by the inconsistent text and the Figure of AS/NZS 3500.2 will also continue with confusion often leading to non-compliant installations and cost to building owners.

Option 2 Non-regulatory.

Providing informative notes under each clause will alert practitioners who may not already be aware of the problems occurring in industry and the best practice means of resolution. This note would be consistent with the recommendations of best practice being advised by industry associations and some Australian plumbing regulators. In New Zealand, MBIE are seeking to promote as guidance to practitioners on best practice. .

Due to the informative nature of the information there is no certainty that suggested installation method would be implemented by all plumbing practitioners. This could see the issues continuing in industry where the installation would be compliant to the requirements of the standard, however not meet the relevant performance requirements of the PCA in that a sanitary drainage system:

- CP2.1 (1) A sanitary drainage system must ensure the following: (a) Sewage is transferred from a sanitary plumbing system to an approved disposal systems.
- CP2.1 (2) A sanitary drainage system must avoid the following: (a) Blockage and uncontrolled discharge.

One of the primary objectives of the PCA are stated to be to safeguard people from loss, due to the failure of a sanitary drainage system. It is considered that this option would see the continuation of the issues raised above occurring and the Deemed-to-Satisfy provisions not adequately meeting the objectives and mandatory Performance Requirements of the PCA.

This option would also see the continued compliant work of plumbing practitioners, whilst building owners are left with the costs associated with rectification.

This is not much of an improvement over the no change option and drainage performance problems will continue.

Option 3. Regulatory.

Requiring an inclined junction will resolve the performance problems of junctions installed on grade. The benefits implementation of a regulatory requirement will be –

- Minimising standing/blockages of solids and paper in junctions and branch lines.
- Minimising wastage of water in the drain by reducing back wash of the flush discharge into the junctions and branch lines.
- Reduce significant plumbing costs to clear blocked drains.
- Improve waste transportation efficiency performance of the drainage network.
- Provide clarity to industry, where drains were to be laid at grade using best practices.

To further minimise the potential impacts of this change, the amendment will only apply to new work with pipework of DN 100. This is due to the potential issues in meeting this requirement for existing installations, however where this can be achieved, it has been recommended. The proposed change has been limited to this pipework size as the research was only conducted on

pipework of this size. Again to minimise any potential impacts of this proposed amendment, the inclusion has been limited to apply to only junctions from the main line.

Whilst there is considered to be equal benefits in applying this change to larger pipe sizes and other areas of the sanitary drainage system, the proposed change is limited to the research which was undertaken to support this change. No further researched into other inclinations or areas of the sanitary plumbing or drainage systems have been proposed at this time.

It is considered that there would not be any additional cost of implementing the change to the plumbing practitioner, with no increase in the number fittings required in the majority of 45 degree junction installations or increase in time taken to install the junction. Consultation has also indicated that plumbing practitioners are already undertaking this installation practice and in these instances, no change in practice would be required.

To further investigate the implications of this proposed change, Standards Australia's WS-14 committee conducted a study to determine the increase in height associated with inclining the junction 15 degrees. This height increase was measured to be 43mm (see image below).

This image shows the approximate increase in pipework height is 43mm resulting from an increase in inclination of the junction by 15 degrees.

This additional space requirement has been considered by the WS-014 committee and discussed during consultations with the Plumbing Code Committee.

The impacts on the building are considered to primarily effect residential construction as commercial buildings generally have pipework exposed in accessible in areas such as basements. Anecdotal evidence gathered through consultation with building industry representatives has indicated that any cost impacts on the building would be minimal (if any) where the building has been appropriately designed to accommodate the building services such as the sanitary plumbing system.

Any cost increases to the building are considered to minimal when compared to the potential savings where rectification works would be required, especially as these rectification works would

be at the expense of the building owner due to the plumbing installation being deemed compliant.

Reducing chokes/blockages of sanitary drainage systems will prevent significant rectification costs, including on-going plumbing clearance costs both on-site and for Network Utility Operators in both commercial and domestic applications.

Sanitary drainage systems will be more efficient in drain line waste transportation performance due to minimising water loss, changes in direction, waste stranding caused by junctions into branch lines.

All stakeholders consulted agree that the proposed amendment will assist plumbing regulators, designers and practitioners by reducing the risk of confusion, misinterpretation of installation specifications and regulatory requirements and ensure that the risks of waste stranding a minimised.

TRANSITIONAL MEASURES

No transitional measures are considered necessary as the changes proposed are being recommended to industry as best practice currently or are already considered to be being utilised by plumbing practitioners.

This amendment will take place as part of the NCC 2022 revision cycle and will be published prior to adoption of the NCC in 2022 allowing industry to see the changes and make any changes to current practice prior to becoming a regulatory requirement.

CONSULTATION:

This proposed amendment was drafted by the Australian and New Zealand plumbing industry, in consultation with State and Territory Plumbing Regulators (through the Australian Building Codes Board) and New Zealand Ministry of Business, Innovation and Employment (MBIE).

All stakeholders consulted agree that this amendment will assist plumbing regulators, designers and practitioners by reducing the risk of misinterpretation of installation specifications and regulatory requirements and ensure that the risks of waste stranding a minimised.

Both Standards Australia's WS-014 committee and the ABCB's Plumbing Code Committee have been consulted on this project. WS-014 consists of a wide range of representatives from the plumbing industry.

A representative from New South Wales Plumbing Administration presented to the WS-014 committee in 2019 regarding the issue and discussed with the committee the potential for unintended consequences for the proposed change to existing installations.

The proposal was also discussed with members of the ABCB's Plumbing Code Committee were concerned about certain aspects of the original proposal were discussed.

New Zealand's MBIE has sought feedback on this proposed change as part of the June 2020 Bi-annual Building Code Update consultation. The consultation document can be located here – refer to appendix pages 196-197:

https://www.mbie.govt.nz/dmsdocument/10990-consultation-document-for-amending-acceptable-solutions-and-verification-methods

All feedback received regarding this proposal indicated stakeholder support within NZ and no objections were submitted. A number of submitters requested that industry guidance be provided to accompany this change, which MBIE intends to provide.

Based on the consultation feedback, MBIE intends to incorporate this proposed change as modification to the referencing of AS/NZS 3500.2:2018 within the next NZ Building Code update, which is now scheduled to be published in October 2020.

Feedback will be provided to WS-014 and ABCB regarding the implementation of this change in NZ.

As a result of these meetings and further correspondence the original proposal was changed to address each of these areas of concern. This has resulted in a limitation of the application of these requirements to new installations and DN 100 pipes only.

For repairs to existing installations the incline was only recommended as best practice due to concern that in some cases there may not be sufficient headroom to put in the incline.

The Western Australia Plumbing Administration released a Plumbers Technical Note which, among other issues, addresses the subject and advises on best practice. This indicates WA were concerned about the problem and in the absence of a regulatory solution implemented a local solution. The note can be located here:
https://www.commerce.wa.gov.au/publications/plumbers-technical-note-junctions-sanitary-and-drainage-systems

A representative from the HCAA has also consulted with some major plumbing contractors within New South Wales and circulated a request for information. The results of this consultation are included in Attachment B.

Standards Australia's WS-003 (sanitary plumbing fixates) committee have discussed this proposal in February 2020 with all members supporting the proposed changes without objection.

The draft of AS/NZS 3500.2 will be released for public consultation where members of the Plumbing Code Committee and the general public will be invited to provide comment on the draft. The public comment draft is intended for release in the first half of 2020.

The Draft includes a 'Drafting Note' to draw out additional information from the pluming industry in regards to this proposed change. The Drafting Note states the following:

> *DRAFTING NOTE:*
> *WS-014 is requesting feedback from plumbing practitioners on the proposed changes to Clause 4.9.1 (sanitary drainage) and Clause 6.6.2.4 (sanitary plumbing in buildings) requiring the elevation of a branch drain joining anther drain to be raised by 15°. This change is intended to reduce the number of stranding's and blockages. These can occur when there is a loss of flushing water up the "at grade" branch drain reducing the water volume and velocity in the waste water pipe below the critical carrying velocity required to*

move solids thus stranding the solid which causes blockages. The requirements for increased water efficiency such as low flush toilets has exacerbated the situation since there is a reduced flush volume.

As a result of the change to the entry angle there will be a slight increase of required space, around 45mm. There has been some concern expressed that there may not be sufficient space available for additions to existing sanitary drainage systems. This would make it difficult to comply with the new requirements. For this reason it is proposed that the 15° angle only be a requirement for new sanitary plumbing and drainage systems. For repairs or additions to existing systems use of the 15° angle will only be a recommendation.
When responding to this request for information, it would be appreciated if you could address the following points:

1. *Have you experienced blockages, waste stranding or failures caused by this issue?*
2. *Do you currently install junctions on an incline as best practice?*
3. *Would you support the proposed change as a mandatory requirement for:*
   (a) New installations only.
   (b) All installations.
4. *Do you believe that there would be any major problems or unforeseen consequences created by the change?*
5. *Would you agree that in most instances raising the branch drain by approx. 45mm by inclining the junction will not cause any major problems?*
6. *What types of building do you undertake sanitary plumbing and drainage works on? If possible, provide building class and/or description.*
7. *Which is the State or Territory that you do your most work in.*

The feedback from industry is intended to provide further input into this analysis on the impacts of this change as anecdotal evidence currently suggests the impacts to my minimal due to industry already undertaking this proposed change as best practice. The feedback is also considered to assist in identifying the extent of the problem.

Comment from the building industry representatives on the ABCB's Plumbing Code Committee is encouraged by this analysis.

CONCLUSION AND RECOMMENDED OPTION:

Option 3 is recommended as it will overcome current drainage performance problems experience with junctions laid across Australia and New Zealand. This will provide more efficient drainage systems and promote best plumbing practice. Options 1 and 2 will not resolve the current situation and will allow for performance issues to continue.

IMPLEMENTATION AND REVIEW:

Amendment to these standards are intended to be implemented as part of the 2022 NCC revision cycle.

LIST OF ATTACHMENTS:
• Attachment A – Major changes • Attachment B — Industry Consultation.

Attachment A: CHANGES TO 3500.2

4.9.1 Drains installed at grade

4.9.1.1 General

The connection of any drain to a graded drain shall be by means of a junction with an upstream angle not greater than 45° ~~and.~~ The connection shall conform to the following:

(a) Double 45° junctions shall not be used.

~~(b) Where a junction is used to make the connection of a branch drain to a main drain of the same size, the entry level of the branch drain may be on grade.~~

(c~~(b~~) Where unequal junctions are used, the invert of the branch drain shall be at least 10 mm higher than the soffit of the drain to which it connects.

NOTE: See Figure 4.9.1 for a typical arrangement of drains joined at grade,

4.9.1.2 New installations

Where a junction is used to make the connection of a DN100 branch drain to another DN100 drain, the entry level of the branch drain shall be elevated at an incline of not less than 15° above the horizontal.

NOTE 1: Positioning the junction a minimum of 15° above horizontal removes the probability of the partial backwash of a discharge into the branch causing stranding that leads to blockages in the drain.

NOTE 2: Refer to AS/NZS 3500.0 for the definition of a branch drain.

4.9.1.3 Other installations

For repairs or extensions to existing installations, or where the main and branch drains are not DN100, the entry level of the branch drain may be on grade.

NOTE: Where sufficient height is available in existing installations, to avoid the potential for blockages it is recommended the provisions of Clause 4.9.1.2 be followed.

6.6.2.4 Junctions installed at grade

~~Discharge pipes shall be joined to each other by means of a 45° junction, and the following apply:~~

~~(a) Where a junction is used to make the connection of a branch drain to a main drain of the same size, the entry level of the branch drain may be on grade.~~

~~(b) Where unequal size junctions are used, the invert of the branch pipe shall be 10 mm higher than the soffit of the pipe to which it connects.~~

6.6.2.4.1 General

The connection of any drain to a graded drain shall be by means of a junction with an upstream angle not greater than 45°. Where unequal junctions are used, the invert of the branch drain shall be at least 10 mm higher than the soffit of the drain to which it connects.

NOTE: See Figure 4.9.1 for a typical arrangement of drains joined at grade,

6.6.2.4.2 New installations

Where a junction is used to make the connection of a DN 100 branch drain to another DN 100 drain, the entry level of the branch drain shall be elevated at an incline of not less than 15° above the horizontal.

NOTE 1: See Figure 4.9.1(a) for a typical example.

NOTE 2: Positioning the junction a minimum of 15° above horizontal removes the probability of the partial backwash of a discharge into the branch causing stranding that leads to blockages in the drain.

NOTE 3: Refer to AS/NZS 3500.0 for the definition of a branch drain.

6.6.2.4.3 Other installations

For repairs or extensions to existing installations the entry level of the branch drain may be on grade.

NOTE: Where sufficient height is available in existing installations, to avoid the potential for blockages it is recommended the provisions of Clause 6.6.2.4.1 be followed

Attachment B: Industry Consultation

The below information was provided in response to some initial consultation with some major plumbing contractors in regards to the proposed amendments. Whilst not wide reaching, this consultation was used to provide an initial indication into the impacts to the plumbing industry.

Responses have been de-identified with respondents allocated an identifying number.

1. Have you experienced blockages, waste stranding or failures caused by this issue?	Consultation results	
	R1	Yes
	R2	No, only an issue if the drain has been laid very flat.
	R3	Yes
	R4	Yes
	R5	No
	R6	Yes I have, in low flow branch lines (single hand basin lines)

2. Do you currently install junctions on an incline as best practice?	Consultation results	
	R1	Yes
	R2	Yes
	R3	Yes
	R4	Yes
	R5	Yes we do
	R6	Yes

3. Would you support the proposed change as a mandatory requirement for: a) New installations only. b) All installations.	Consultation results	
	R1	(a) Yes (b) No. Would like it to be mandatory as a yes, but it is impossible in every case, due to current structures are in place & design limitations around those structures
	R2	(a) Yes (b) No idea how this would be done without a significant cost and disruption.
	R3	(a) N/A (b) Yes - All installations
	R4	(a) Yes (b) Yes…. But very difficult to do/police/mandate etc….. therefore impossible
	R5	(a) N/A (b) Yes
	R6	(a) N/A (b) Yes I would

4. Do you believe that there would be any major problems or unforeseen consequences created by the change?	Consultation results	
	R1	Design & spatial restrictions, especially in multi-storey projects & where it is required to be installed in tight ceiling spaces & voids.

	R2	Only on suspended pipework with limited ceiling/void space. The extra 45mm will be an issue.
	R3	In rare occasions where alterations to an existing drain are required, lack of height may become an issue requiring the plumber to replace more drainage than otherwise would have been required. I don't believe this should prevent this vital change.
	R4	Some spaces between floors are too tight as it is and this will make it worse…. But this should not prevent this necessary change
	R5	Minimal impact on ceilings spatial. However we have been installing our underfloor drainage for years like this and haven't experienced any issues.
	R6	No I don't. Ceiling heights may need to be adjusted.

5. Would you agree that in most instances raising the branch drain by approx. 45mm by inclining the junction will not cause any major problems?	Consultation results	
	R1	Design & spatial restrictions, especially where it is required to be installed in ceilings & voids works.
	R2	Yes on suspended drainage. Have not had an issue with blockages on suspended pipework in the past.
	R3	Yes, it will not cause major problems.
	R4	As above, possibly in too tightly designed spaces between floors…. But this should not prevent this necessary change
	R5	Yes, in fact we install the branch drain overt to invert as best practice.
	R6	Yes I would agree.

6. What types of building do you undertake sanitary plumbing and drainage works on? If possible, provide building class and/or description.	Consultation results	
	R1	All types – domestic, commercial, industrial, multi-storey
	R2	Class 1a, Class 2, Class 5, & Class 6 Buildings
	R3	Multiunit complex's and freestanding residential homes - Primarily renovations and maintenance
	R4	No response provided.
	R5	Multistorey residential apartments (current tallest in NSW and VIC), Large Hospitals.
	R6	Hospitals

7. Which is the State or Territory that you do your most work in.	Consultation results	
	R1	South Australia
	R2	Western Australia
	R3	ACT
	R4	Tasmania
	R5	NSW, QLD, VIC, ACT and SA (New Guinea, Fiji and China)
	R6	New South Whales