

## Drainage | DR 05 | Junctions in gravity discharge sanitary and drainage systems

### Audience

The audience/s for this Practice Note include/s:

- |  |   |
|--|---|
| <input checked="" type="checkbox"/> Architects/ Designers          | <input checked="" type="checkbox"/> Owner Builders                  |
| <input checked="" type="checkbox"/> Builders                       | <input checked="" type="checkbox"/> Plumbers                        |
| <input checked="" type="checkbox"/> Building Surveyors/ Inspectors | <input type="checkbox"/> Real estate management agents              |
| <input checked="" type="checkbox"/> Engineers                      | <input type="checkbox"/> Trades and Maintenance (inc. Electricians) |
| <input type="checkbox"/> Home Owners / Residential Tenants         |   |

### Purpose

This Practice Note provides guidance on the use of junction fittings installed in gravity discharge sanitary and drainage systems.

The content below provides guidance on:

- Junction fittings permitted on grade
- Junction fittings not permitted on grade
- Junctions installed in vertical plane
- Square junctions in drains on vertical risers & as inspection openings
- Junctions permitted for Jump ups on Sanitary Drainage Systems



For guidance on the plumbing regulatory framework refer to Plumbing Practice Note Regulatory Framework RF 01| Plumbing Regulatory Framework– NCC 2022

### Abbreviations & Definitions

The abbreviations and definitions set out below are for guidance only. They are not intended to vary those set out in the Building Act 1993 Plumbing Regulations 2018 or the NCC.

- **AS** - Australian Standard
- **AS/NZS** - Australian/ New Zealand Standard
- **NCC** – National Construction Code
- **Regulations** - Plumbing Regulations 2018



For further information refer to other relevant drainage practice notes: DR-02 Checking bedding material for below ground drainage systems & DR-04 Drains in Reactive soils



## Use of sweep junctions

Historically sweep junctions have been installed on grade in both above and below ground sanitary drainage systems. Since this time the design of these fittings has changed to incorporate a reduced throat radius.

An increased occurrence of blockages in sanitary drainage systems has been attributed to the use of sweep junctions installed on grade. This problem is compounded when several sweep junctions are installed near each other, particularly when receiving discharges from soil fixtures. Reduced wastewater flow & flat or reduced grade on drains has also contributed to this problem.

Changes to the deemed-to-satisfy (DtS) standard, AS/NZS 3500.2 no longer permits sweep junctions to be installed on grade. For guidance on the use of sweep junctions in various positions refer to Table 1 Sweep junction (limitations of use).

## Use of 45°(OB) junctions


Recent changes to the AS/NZS 3500.2 limit the use of oblique junctions, also known as 45° or OB junctions. The limitations are intended to reduce the likelihood of waste stranding that can occur when wastewater back-washes into junctions that are connected on grade. Table 2 provides guidance on the use of equal 45° junctions in various positions and Table 3 provides guidance on the use of equal and unequal 45° junctions on grade.

## Use of square (90°) junctions

The use of square junctions is very limited in above and below ground drainage and sanitary pipe work, plumbers must be aware of these limitations when installing square junctions. Table 4 provides guidance on the use of square junctions in above and below ground drainage and sanitary pipe work.






**Table 1-** Sweep junction in various positions (limitations of use).

SWEEP JUNCTION ORIENTATION	GENERAL USE AND LIMITATIONS (subject to requirements of the standards)	BELOW GROUND SANITARY DRAINAGE	ABOVE GROUND SANITARY PLUMBING	BELOW GROUND STORMWATER DRAINAGE
<p><b>SWEEP JUNCTION on grade</b></p> 	<ul style="list-style-type: none"> <li>• Not permitted in below ground sanitary drainage.</li> <li>• Limited used in graded pipes, see referenced clauses for guidance</li> </ul>	<b>NOT PERMITTED</b>	<p><b>AS/NZS 3500.2:2021- Clauses;</b></p> <ul style="list-style-type: none"> <li>• 6.6.2.3 Junctions in graded pipes</li> <li>• 6.6.2.4.1 General</li> <li>• 9.5.10- Connection of ranges of fixtures,</li> </ul>	<p><b>AS/NZS 3500.3:2021- Clauses;</b></p> <ul style="list-style-type: none"> <li>• 6.3.1.1 Site stormwater drains.</li> </ul>
<p><b>SWEEP JUNCTION vertical, center on grade</b></p> 	<ul style="list-style-type: none"> <li>• Restrictions apply to connections in sanitary stacks refer to the requirements of the standard</li> <li>• May be used at the top of a jump-up</li> <li>• May form part of a gully riser</li> </ul>	<p><b>AS/NZS 3500.2:2021- Clauses;</b></p> <ul style="list-style-type: none"> <li>• 4.10- Jump-ups</li> </ul>	<p><b>AS/NZS 3500.2:2021- Clauses;</b></p> <ul style="list-style-type: none"> <li>• 6.7 Junctions in stacks</li> <li>• 6.7.1 Types</li> <li>• 6.11.2- Installation of pressure attenuators,</li> <li>• 8.5.1.5- Common vent for fixtures,</li> <li>• 9.8.7.2-Steep offsets,</li> <li>• 9.5.10 Connection of ranges of fixtures</li> </ul>	<p><b>AS/NZS 3500.3:2021- Clauses;</b></p> <ul style="list-style-type: none"> <li>• 6.3.1.1 Site stormwater drains,</li> <li>• 7.8 Jump-ups</li> <li>• Figure 7.8</li> </ul>
<p><b>SWEEP JUCTION on back- centre vertical</b></p> 	<ul style="list-style-type: none"> <li>• Not permitted in below ground sanitary drainage</li> <li>• Not permitted in above ground sanitary plumbing system</li> </ul>	<b>NOT PERMITTED</b>	<b>NOT PERMITTED</b>	<p><b>AS/NZS 3500.3:2021- Clauses;</b></p> <ul style="list-style-type: none"> <li>• 7.8 Jump-ups</li> <li>• Figure 7.8</li> </ul>
<p><b>DOUBLE SWEEP JUNCTION all positions</b></p> 	<ul style="list-style-type: none"> <li>• Not permitted on grade.</li> <li>• Limited use in vertical orientation</li> </ul>	<b>NOT PERMITTED</b>	<p><b>AS/NZS 3500.2:2021-Clauses;</b></p> <ul style="list-style-type: none"> <li>• 6.6.2.3 Junctions in graded pipes</li> <li>• 6.7.3.1- Opposed connections [same level],</li> <li>• 6.7.3.2-At different levels</li> </ul>	<b>PERMITTED</b>






**Table 2-** 45° junctions in various positions (limitations of use).

DN100 45°(OB) JUNCTIONS ORIENTATION	GENERAL USE AND LIMITATIONS (subject to requirements of the standards)	BELOW GROUND SANITARY DRAINAGE	ABOVE GROUND SANITARY PLUMBING	BELOW GROUND STORMWATER DRAINAGE
<b>DN100 45° JUNCTION</b> Vertical- centre horizontal 	<ul style="list-style-type: none"> <li>Restrictions apply to connections in stacks refer to the requirements of the standard</li> <li>May be used at the top of a jump-up</li> </ul>	AS/NZS 3500.2:2021- Clauses; <ul style="list-style-type: none"> <li>4.10 Jump-ups</li> </ul>	AS/NZS 3500.2:2021- Clauses; <ul style="list-style-type: none"> <li>6.7 Junctions in stacks</li> <li>6.7.1 Types</li> <li>6.7.3.1- Opposed connections [same level],</li> <li>6.7.3.2-At different levels</li> <li>9.5.6 Connection from waste fixtures to stack</li> <li>9.5.10 Connection of ranges of fixtures</li> </ul>	AS/NZS 3500.3:2021- Clauses; <ul style="list-style-type: none"> <li>7.8 Jump-ups</li> <li>Figure 7.8</li> </ul>
<b>DN100 45° JUNCTION</b> on back- centre vertical 	<ul style="list-style-type: none"> <li>May connect stack to above ground pipework, subject to requirements of the standard</li> <li>May be used in the vertical plane for the connection of a single fixture subject to requirements of the standard</li> <li>May be used at the base of a jump-up</li> </ul>	AS/NZS 3500.2:2021- Clauses; <ul style="list-style-type: none"> <li>4.9.2 Junctions installed in vertical plane</li> <li>6.6.2.5 Junctions installed in a vertical plane</li> </ul>	AS/NZS 3500.2:2021- Clauses; <ul style="list-style-type: none"> <li>6.6.2.5 Junctions installed in a vertical plane</li> <li>6.8.3 Connection of stacks to graded pipes or drains above ground</li> <li>9.5.10 Connection of ranges of fixtures</li> </ul>	AS/NZS 3500.3:2021- Clauses; <ul style="list-style-type: none"> <li>7.8 Jump-ups</li> <li>Figure 7.8</li> </ul>
<b>Double 45° JUNCTION</b> Vertical 	Double 45° junctions shall not be used; <ul style="list-style-type: none"> <li>on grade or,</li> <li>in the horizontal plane or,</li> <li>For the connection of any drain to a graded drain</li> </ul>	AS/NZS 3500.2:2021- Clauses; <ul style="list-style-type: none"> <li>4.9.1.1 General</li> </ul>	AS/NZS 3500.2:2021- Clauses; <ul style="list-style-type: none"> <li>6.6.2.3 Junctions in graded pipes</li> </ul>	PERMITTED






**Table 3-** 45° equal and unequal 45° junctions on grade (limitations of use).

DN100 45°(OB) JUNCTIONS ORIENTATION	GENERAL USE AND LIMITATIONS (subject to requirements of the standards)	BELOW GROUND SANITARY DRAINAGE	ABOVE GROUND SANITARY PLUMBING	BELOW GROUND STORMWATER DRAINAGE
<p><b>DN100 45° JUNCTION – 15° above the horizontal.</b></p>  <p>15° above horizontal</p>	<ul style="list-style-type: none"> <li>• <b>Above ground in a new installation -</b> Applies to sanitary plumbing systems, where a 100mm junction connects a 100mm branch, the entry level of the branch pipe must be rotated to 15° above the horizontal.</li> <li>• In class 1 buildings, where the 15° cannot be achieved, the incline must be as close as possible to 15° to avoid stranding</li> <li>• <b>Below ground in a new installation -</b> Applies to sanitary drainage systems in all classes of buildings, where a 100mm junction connects a 100mm branch, the entry level of the branch pipe must be rotated to <b>not less than 15°</b> above the horizontal.</li> </ul>	<p>AS/NZS 3500.2:2021- Clauses;</p> <ul style="list-style-type: none"> <li>• 4.9.1.2 New installations</li> </ul>	<p>AS/NZS 3500.2:2021- Clauses;</p> <ul style="list-style-type: none"> <li>• 6.6.2.3 Junctions in graded pipes</li> <li>• <b>6.6.2.4.2 is amended by the Plumbing Code of Australia, Vic C1D3</b></li> <li>• 6.8.3 Connection of stacks to graded pipes or drains above ground</li> <li>• 9.5.10- Connection of ranges of fixtures.</li> </ul>	<p><b>PERMITTED</b></p>
<p><b>DN100 45° JUNCTION – On grade.</b></p> 	<ul style="list-style-type: none"> <li>• <b>Below ground -</b> DN100 junctions may be used on grade for repairs or extensions to existing sanitary drain installations; <u>if</u> there are no WC pans connected upstream; <u>or if</u> the main and branch drains are not DN 100.</li> <li>• May be used in combination with an 88° bend for the connection of a stack to a below ground drain</li> <li>• Permitted on grade in a stormwater drain.</li> </ul> <p><b>NOTE:</b> There are different requirements for the use of unequal junctions on grade (see below)</p>	<p>AS/NZS 3500.2:2021- Clauses;</p> <ul style="list-style-type: none"> <li>• 4.9.1.1 General,</li> <li>• 4.9.1.2 New installations</li> <li>• 4.9.1.3 Other installations</li> <li>• 4.9.4 Junctions for stacks connected to below-ground drainage</li> </ul>	<p>AS/NZS 3500.2:2021- Clauses;</p> <ul style="list-style-type: none"> <li>• 4.9.4 Junctions for stacks connected to below-ground drainage</li> <li>• 6.6.2.3 Junctions in graded pipes</li> <li>• 6.6.2.4.1 General</li> <li>• <b>6.6.2.4.2 is amended by the Plumbing Code of Australia, Vic C1D3</b></li> <li>• 6.8.3 Connection of stacks to graded pipes or drains above ground</li> <li>• 9.5.10 Connection of ranges of fixtures</li> </ul>	<p>AS/NZS 3500.3:2021- Clauses;</p> <ul style="list-style-type: none"> <li>• AS/NZS 3500.3:2021- Clauses;</li> <li>• 6.3.1.1 Site stormwater drains,</li> <li>• 7.7.1 General</li> <li>• <b>Permitted on grade</b></li> </ul>
<p><b>Unequal 45° JUNCTION – Invert 10mm higher than soffit.</b></p>  <p>10mm higher</p>	<ul style="list-style-type: none"> <li>• <b>Above and below ground in sanitary and drainage systems -</b> unequal junctions may be used on grade if the invert of the branch drain it at least 10mm higher than the soffit of the drain to which it connects</li> <li>• May be used in the vertical plane for the connection of a single fixture subject to requirements of the standard.</li> </ul>	<p>AS/NZS 3500.2:2021- Clauses;</p> <ul style="list-style-type: none"> <li>• 4.9.1 Drains installed at grade</li> <li>• 4.9.1.1 General</li> <li>• 6.6.2.3 Junctions in graded pipes</li> <li>• 6.6.2.4 Junctions installed at grade</li> <li>• 6.6.2.4.1 General</li> </ul>	<p>AS/NZS 3500.2:2021- Clauses;</p> <ul style="list-style-type: none"> <li>• 4.9.1 Drains installed at grade</li> <li>• 4.9.1.1 General</li> <li>• 6.6.2.3 Junctions in graded pipes</li> <li>• 6.6.2.4 Junctions installed at grade</li> <li>• 6.6.2.4.1 General</li> </ul>	<p><b>PERMITTED</b></p>





**Table 4-** square junctions in above and below ground drainage and sanitary pipe work (limitations of use).

SQUARE JUNCTION ORIENTATION	GENERAL USE AND LIMITATIONS (subject to requirements of the standards)	BELOW GROUND SANITARY DRAINAGE	ABOVE GROUND SANITARY PLUMBING	BELOW GROUND STORMWATER DRAINAGE
<p><b>SQUARE JUNCTION –</b> Vertical, centre on grade</p> 	<p>In <b>below ground sanitary drains</b> shall be used only:</p> <ul style="list-style-type: none"> <li>at the top of a jump-up at the point of connection</li> <li>for connection of a graded drain to a boundary trap riser</li> <li>for connection of a vent to a boundary trap riser</li> <li>as the inlet riser of a gully or floor waste gully</li> </ul> <p>In <b>below ground stormwater drains</b> shall be used only:</p> <ul style="list-style-type: none"> <li>at the top of a jump-up at the point of connection</li> <li>as an inspection opening;</li> </ul>	<p><b>AS/NZS 3500.2:2021, Clauses-</b></p> <ul style="list-style-type: none"> <li>4.4.3 Installation of inspection shafts</li> <li>4.4.3.1 General</li> <li>4.7.3 Types</li> <li>4.9.3 Square junctions</li> <li>4.10 Jump-ups</li> </ul>	<p><b>AS/NZS 3500.2:2021, Clauses-</b></p> <ul style="list-style-type: none"> <li>4.7.3 Types</li> <li>6.7 Junctions in stacks</li> <li>6.7.1 Types</li> <li>6.7.2 Restrictions for square and ball junctions</li> </ul>	<p><b>AS/NZS 3500.3:2021 Clauses-</b></p> <ul style="list-style-type: none"> <li>7.7 Junctions</li> <li>7.7.2 Square junctions</li> <li>7.8 Jump-ups</li> </ul>
<p><b>SQUARE JUNCTION –</b> On back, centre vertical</p> 	<p>Square junctions shall be used only:</p> <ul style="list-style-type: none"> <li>For connection of an inspection shaft to a drain on grade</li> <li>as an inspection opening;</li> </ul>	<p><b>AS/NZS 3500.2:2021, Clauses-</b></p> <ul style="list-style-type: none"> <li>4.4.3 Installation of inspection shafts</li> <li>4.4.3.1 General</li> <li>4.9.1 Drains installed at grade</li> <li>4.9.1.1 General</li> <li>4.9.3 Square junctions</li> <li>5.3 Concrete support for drains</li> <li>12.6.2 Inlet to wet well</li> </ul>	<p><b>AS/NZS 3500.2:2021, Clauses-</b></p> <ul style="list-style-type: none"> <li>4.7.3 Types</li> <li>4.9.3 Square junctions</li> <li>6.6.2.5 Junctions installed in a vertical plane</li> <li>6.6.2.6 Junctions for stacks connected to a graded pipe</li> <li>6.7 Junctions in stacks</li> <li>6.7.1 Types</li> <li>6.7.2 Restrictions for square and ball junctions</li> </ul>	<p><b>AS/NZS 3500.3:2021 Clauses-</b></p> <ul style="list-style-type: none"> <li>7.7.2 Square junctions</li> </ul>
<p><b>SQUARE JUNCTION –</b>On grade</p> 	<p>Square junctions <b>shall not be used</b>;</p> <ul style="list-style-type: none"> <li>In horizontal plane for the connection of a fixture</li> <li>for the connection of any drain to a graded drain</li> </ul>	<p><b>AS/NZS 3500.2:2021, Clauses-</b></p> <ul style="list-style-type: none"> <li>4.9.1 Drains installed at grade</li> <li>4.9.1.1 General</li> <li>4.9.1.2 New installations</li> <li>4.9.3 Square junctions</li> <li>4.9.4 Junctions for stacks connected to below-ground drainage</li> </ul>	<p><b>AS/NZS 3500.2:2021, Clauses-</b></p> <ul style="list-style-type: none"> <li>6.6.2.3 Junctions in graded pipes</li> <li>6.6.2.4 Junctions installed at grade</li> <li>6.6.2.4.1 General</li> <li>6.6.2.4.2 New installations</li> <li>6.6.2.5 Junctions installed in a vertical plane</li> </ul>	<p><b>AS/NZS 3500.3:2021 Clauses-</b></p> <ul style="list-style-type: none"> <li>7.7.2 Square junctions</li> </ul>



**Related Documentation**

- Building Act 1993
- Plumbing Regulations 2018
- National Construction Code 2022 Volume Three - Plumbing Code of Australia
- AS/NZS 3500.2:2021 – Part 2: Sanitary Plumbing and Drainage

**List of Amendments**

- Restructure of information into tabulated format for ease of reading
- Inclusion of pictures to explain orientation of fittings.
- Change of name to include sanitary and stormwater systems and exclude vacuum drainage.
- Updated to the current version of the NCC and referenced documents

**Document history**

<b>Sector</b>	Plumbing
<b>Category</b>	Drainage
<b>Topic</b>	Junctions in drains
<b>Document number</b>	05
<b>Version</b>	3.0
<b>Superseded</b>	<ul style="list-style-type: none"> <li>• Version 2.0, published 24 July 2023</li> <li>• Technical Solution Sheet 3.11 Junctions installed at a grade, 3.12 Junction fittings installed other than on grade &amp; 3.13 Junction installed in the vertical plane (on their backs).</li> </ul>
<b>Published</b>	14 December 2023

**Contact Us**

If you have a technical enquiry, please email [plumbingtechnicaladvice@vba.vic.gov.au](mailto:plumbingtechnicaladvice@vba.vic.gov.au) or call 1300 815 127.

**Victorian Building Authority**  
 Goods Shed North  
 733 Bourke Street  
 Docklands VIC 3008  
  
[www.vba.vic.gov.au](http://www.vba.vic.gov.au)

**Copyright and disclaimer**

**Copyright**

© 2021 Victorian Building Authority (VBA). This publication must not be copied, reproduced, published, adapted, or communicated by any person without the VBA’s prior written consent or as permitted by the Copyright Act 1968 (Cth)

**Disclaimer**

The information set out in the VBA’s resources is for general information purposes and guidance only. It is a reader’s responsibility to obtain independent advice in respect of the application of legislation, a technical instruction or industry standard relevant to their circumstances. A person’s use of the VBA’s resources is not a substitute for obtaining independent advice. While we have made every attempt to ensure our resources contain correct information at the date of publication, the VBA makes no warranty or representation that its resources are error free. To the extent permitted by applicable laws, the VBA, its employees, agents and consultants exclude any and all liability whatsoever for any direct, indirect, incidental, special or consequential loss or damage a person may suffer arising out of or in connection with the access and use of the VBA’s resources ‘(including any third-party material included in these resources).’