Government of Western Australia
Department of Mines, Industry Regulation and Safety
Plumbers Licensing Board

Technical Note

Technical Advice Line 1300 360 897 www.dmirs.wa.gov.au/building-and-energy

Junctions in plumbing systems

This technical note covers the requirements for permissible types of junctions and configurations required by AS/NZS 3500.2:2021 for sanitary plumbing and drainage systems. There are new requirements related to the installation of junctions used for connecting graded pipes to graded pipes, graded pipes to rising shafts, stacks and gully risers. Acceptable junction types are shown in photographs on pages 4 and 5.

45° equal junctions on grade in new installations

AS/NZS 3500.2:2021, clause 4.9.1.2 effectively requires the branch of a DN 100, 45° equal junction installed on grade, be elevated at an incline of not less than 15° above the horizontal, see diagram 8.

AS/NZS 3500.2:2021, clause 4.9.1.3 allows for DN 100, 45° equal junction to be installed on grade for repairs, maintenance or extensions to existing drainage systems or where WC pans are not connected upstream of the junction. It is recommended however, that all junctions be installed with a 15° inclination, where possible.

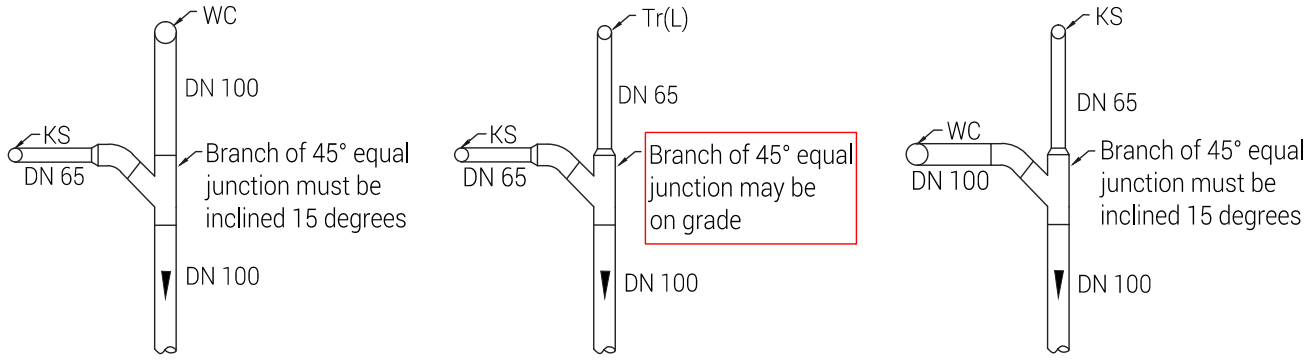

Diagram 1: Requirements for a 15° inclination on graded drains

Junctions serving gullies

The Plumbing Code of Australia 2022, C1D2 for sanitary and C2D2 for drainage, state that the invert level of a trap or gully must be a minimum of 10 mm higher than the soffit of the pipe to which it connects. This means a junction serving floor waste or disconnecter gullies may have to be installed on an incline.

Junctions in graded drains

88° junctions (sweep junctions/curved squares) with a throat radius are not permitted to be used in any position on a graded drain.

Therefore, the connection of any graded branch drain to the graded main drain must be done by using either:

- a 45° junction;
- a maintenance shaft; or
- an inspection chamber.

Photo 1: 88° junctions not permitted on graded drains

This means, the connection of any graded pipe to another graded pipe must be done by using a 45° junction.

Double junctions either 45° or 88° shall not be used to connect pipes on grade.

Junctions forming the base of jump-ups

There are two methods of connecting a branch drain at a higher level to a main drain at a lower level.

- Option 1 - using a 45° junction with grade connected to an 88° bend to form a vertical riser.
- Option 2 - using a 45° junction on its back connected to a 45° bend to form a vertical riser.

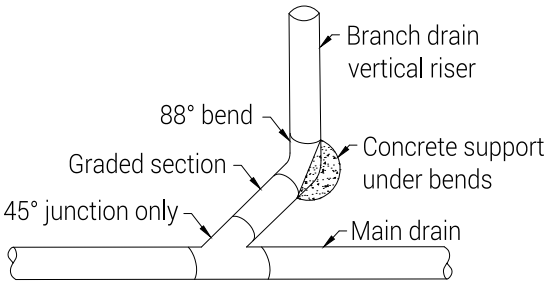

Diagram 2: Option 1 using a 45° junction and 88° bend

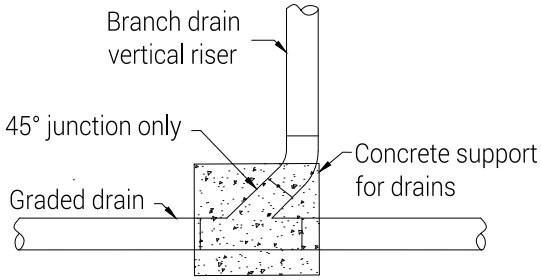

Diagram 3: Option 2 using a 45° junction and 45° bend

Junctions used to connect graded branch drains to vertical risers

The following junctions are permitted when connecting a graded branch drain into a vertical riser:

- a square junction;
- an 88° junction; or
- a 45° junction.

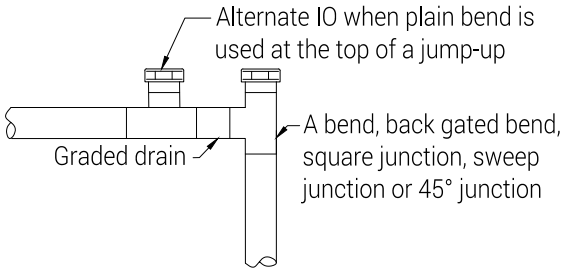

Diagram 4: Junctions used for connecting graded drains to vertical risers

45° junctions forming the base of jump-ups

In diagram 5 where a 45° junction is installed on its back to form a jump-up connecting a graded branch drain to a graded main drain at different levels, the following criteria must be met where applicable:

- Only to be used for connection of a single discharge pipe or drain, not for the connection of stacks.
- The vertical riser does not exceed 2 m in height, above the invert of the graded drain.
- The junction shall be supported by a concrete pad in accordance with AS/NZS 3500.2:2021, clause 5.3.

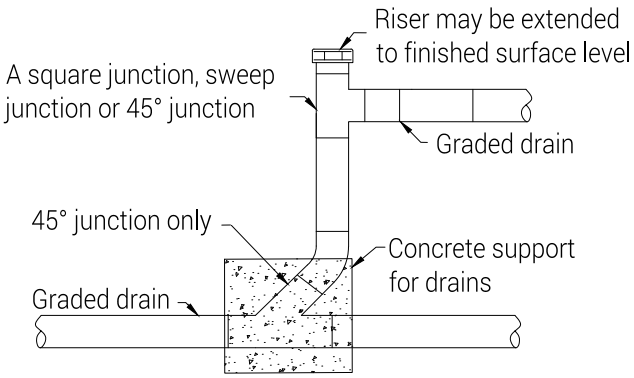

Diagram 5: 45° junction used for vertical jump-up

Junctions for stacks connected to drains

Stacks connected on grade to drains in ground shall be made using a 45° junction and a bend at the base of the stack as specified in AS/NZS 3500.2:2021, clause 6.8.4, see diagram 6.

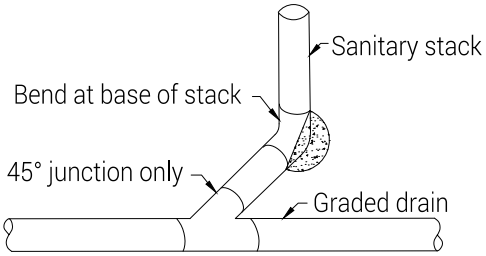

Diagram 6: Connection of stacks to graded drains

Junctions forming the base of raised inspection openings and clean outs in drains

The formation of a raised inspection opening (RIO) from a graded drain may be done by using either:

- a square junction (preferred);
- an 88° junction; or
- a 45° junction.

Photo 2: Typical raised inspection opening using square junction

Junctions forming the base of inspection shafts in drains at the point of connection

The formation of an inspection shaft on grade uses a square junction on its back (ISSOB). This allows easy access for maintenance of the graded drain in both directions. No connections are permitted into the vertical inspection shaft.

A 45° junction installed against the grade of the drain must be installed for inspection shafts on main drains serving vacuum sewer systems. See Plumbers Licensing Board's technical note: Vacuum sewers.

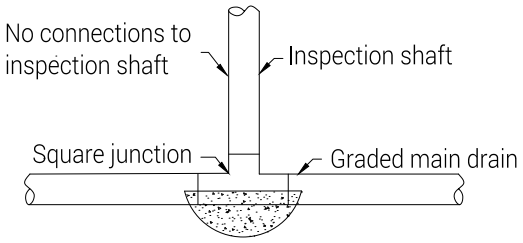

Diagram 7: Square junction forming an ISSOB

Junctions in sanitary plumbing

The connection of any graded discharge branch pipe to another graded pipe must be done by using a 45° junction. 88° junctions are not permitted, see photo 3.

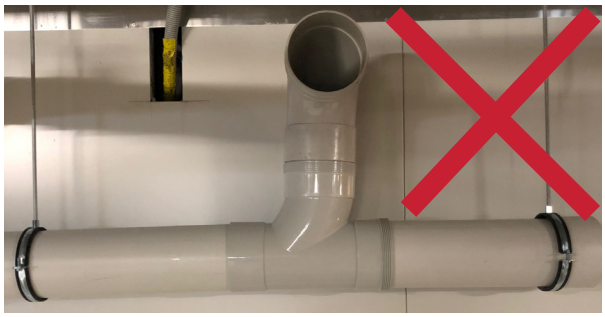

Photo 3: 88° junction on back are not permitted

AS/NZS 3500.2:2021, clause 6.6.2.4.2 effectively requires the branch of a DN 100, 45° equal junction installed on grade, be elevated at an incline of not less than 15° above the horizontal, see diagram 8.

AS/NZS 3500.2:2021, clause 6.6.2.4.3 allows for DN 100, 45° equal junction to be installed on grade for repairs, maintenance or extensions to existing sanitary systems or where WC pans are not connected upstream of the junction. It is recommended however, that all junctions be installed with a 15° inclination, where possible.

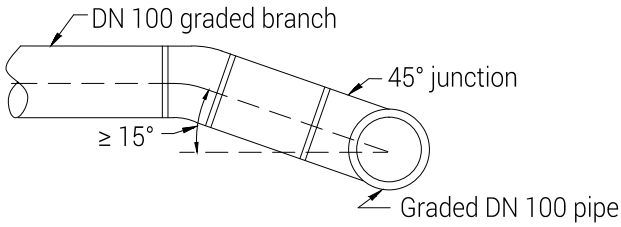

Diagram 8: 45° junction inclined at 15°

Junctions in graded pipes forming vertical risers and stacks

There are two methods of connecting a graded branch pipe to a common graded discharge pipe that are at different levels:

- Option 1 - using a 45° junction with grade connected to an 88° bend to form a vertical riser.
- Option 2 - using a 45° junction on its back connected to a 45° bend to form a vertical riser.

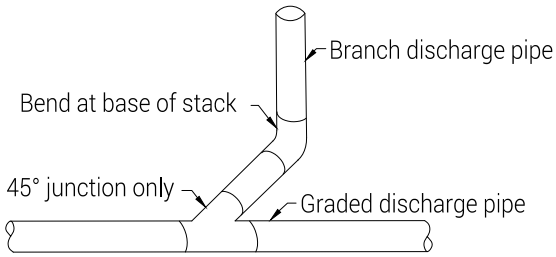

Diagram 9: Option 1 using a 45° junction and 88° bend

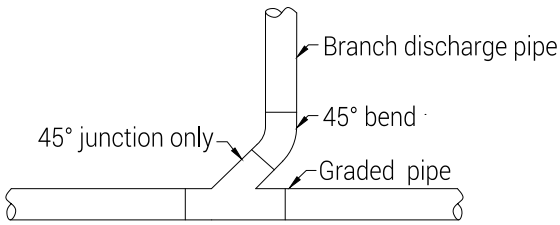

Diagram 10: Option 2 using a 45° junction and 45° bend

Options 1 or 2 may be used to connect a stack to graded pipe although when using option 2, the conditions in AS/NZS 3500.2:2021, clause 6.8.3(b) apply as follows:

The length of the junction branch shall be extended so that the vertical projection of the stack is wholly outside the area of the junction on the graded discharge pipe as shown in diagram 11.

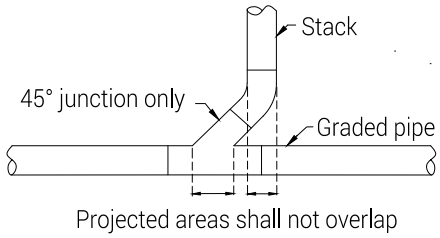

Diagram 11: Top inverting using a 45° junction and 45° bend

Photo 4: 45° junction on back forming a vertical riser

Junctions used to connect branches into stacks

The following types of junctions may be used to connect fixture, branch or common discharge pipes to stacks:

- a square junction;
- an 88° junction;
- a 45° junction;
- an aerator junction;
- a ball junction; or
- a double 45° or double 88° junction.

Unequal junctions in plumbing systems

The use of unequal 45° junctions, for example DN 100 x DN 65 are still permitted. However these junctions must be installed so that the invert of the discharge pipe or branch drain is at least 10 mm higher than the soffit of the graded common discharge pipe or drain to which it connects, see diagram 12.

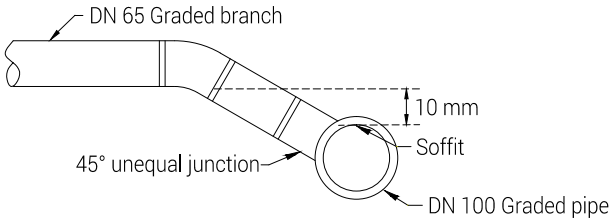

Diagram 12: Unequal 45° junction rolled as required

Concrete support for junctions

Concrete pads used to support drains and vertical risers shall be a minimum of 100 mm thick and shall be laid:

- under all inspection junctions where a riser is brought to the surface;
- for square junctions, beneath the junction to a minimum thickness of 100 mm and continued up vertically to the centre of the junction fitting; and
- for 45° junctions, beneath the junction to a minimum thickness of 100 mm and continued up vertically to the underside of the 45° bend fitted to the 45° junction fitting.

Notes:

1. Although AS/NZS 3500.2:2021, clause 3.4.3 requires anchor blocks on drains with a grade of 20% or more, realistically, this would not apply to the section of drain from a junction inclined at 15^0 if the length of the incline does not exceed 1.5 m.
2. Double junctions either 45° or 88° shall not be used to connect pipes on grade.
3. The use of square junctions in drains shall be in accordance with AS/NZS 3500.2:2021, clause 4.9.3.

Junction types

Shown below are examples of approved junctions.

Photo 5: 45° junction

Photo 6: 88° or sweep junction

Photo 7: Square junction

Photo 10: Double 45° junction

Photo 8: Aerator junction

Photo 11: Double 88° or sweep junction

Photo 9: Ball junction

Photo 12: Unequal 45° junction

Notes

The technical note series is issued by the Plumbers Licensing Board to assist the plumbing industry to comply with the Plumbers Licensing and Plumbing Standards Regulations 2000 (the Regulations) applicable to plumbing work in Western Australia.

Each technical note is to be read in conjunction with Part 6 of the Regulations that currently adopt the Plumbing Code of Australia (PCA) and the deemed to satisfy provisions of AS/NZS 3500:2021, parts 0, 1, 2 and 4 but modified in certain matters to suit the State's building approach and other local conditions.

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