VICTORIAN BUILDING AUTHORITY

PLUMBING PRACTICE NOTE

Roof Plumbing RP 02 | Box Gutters'

Audience

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

- ☒ Architects/ Designers
- ☒ Builders
- ☒ Building Surveyors/ Inspectors
- ☒ Engineers
- ☐ Home Owners / Residential Tenants
- ☒ Owner Builders
- ☒ Plumbers
- ☐ Real estate management agents
- ☒ Trades and Maintenance (inc. Electricians)

Purpose

This Practice Note provides guidance on the Deemed-to-Satisfy (DtS) requirements for the installation of box gutters with sole widths between 200mm and 600mm.

The content below provides guidance on:

- Defining a box gutter
- Design and installation parameters for box gutters
- Requirements for a box gutter support system
- Overflow provisions in a box gutter
- Expansion provision for box gutters
- Collaboration on the design of box gutters

For guidance on regulatory framework, please refer to Plumbing Practice Note RF-01 | Regulatory Framework- NCC

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, the Plumbing Regulations 2018 or the National Construction Code.

- **Act** – Building Act 1993
- **NCC** – National Construction Code 2022
- **AS** – Australian Standard
- **AS/NZS** - Australian/New Zealand Standard
- **DtS** – Deemed-to-Satisfy
- **PCA**– Plumbing Code of Australia (National Construction Code 2022, Volume Three)

VICTORIA State Government

Defining a box gutter

A box gutter is defined as a graded channel, generally of rectangular shape, for the conveyance of rainwater within the building footprint, typically adjacent to a wall or parapet. A box gutter incorporating a lear is also an acceptable shape, provided the minimum sole widths are observed and the effective cross-sectional area of the gutter is appropriately sized for the roof catchment area.

All box gutter installations, whether new or replacement must satisfy the Performance Requirements of the Plumbing Code of Australia (PCA). The Performance Requirements apply to the design, construction, installation, replacement, repair, alteration and maintenance of box gutters. Compliance with the Performance Requirements of the PCA are automatically satisfied by complying with the AS/NZS 3500.3 and HB 39. Alternatively, they can be demonstrated through the Performance Solution process as set out in Section 2 of the PCA. Typical examples of box gutters are shown in Figure 1.

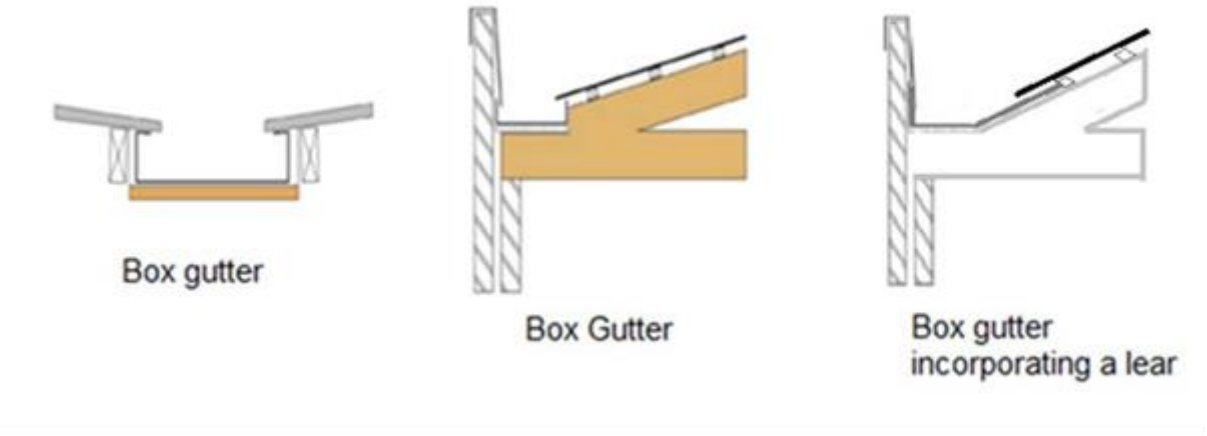


Figure 1: Typical examples of box gutters

V-shaped gutters are not permitted. If installed, they may result in water damage to the building. Damage may be caused by premature failure of the gutter due to inadequate drainage, permanent ponding and debris accumulating in the crevices, which may lead to intense localised corrosion of the gutter.

Guidance on the Plumbing Regulatory Framework and the use of Performance Solutions can be found on the VBA website

Deemed-to-Satisfy design and installation parameters for box gutters

The following information outlines the design parameters that must be adhered to for a box gutter installation to be considered a Deemed-to-Satisfy (DtS) installation:

- All box gutter sizing is based on an AEP (annual exceedance probability) of 1% (100 years ARI),
- The depth of box gutters and sizing of sumps, rainheads, downpipes and overflows must be designed using the general methods specified in the AS/NZS 3500.3,
- The maximum design flow per downpipe can only be plotted between 3 and 16 Litres per second,
- 100mm x 50mm downpipes are not an option that can be plotted from the standard for use with a sump,
- Box gutters sole widths can be plotted in 200mm, 300mm, 375mm 450mm, 525mm and 600mm. (can be a size in between if it is sized to the lower sole width),
- The minimum width of any box gutter: Domestic 200 mm and Commercial 300 mm,
- Box gutter sole widths of 200 mm cannot accommodate flow rates exceeding 10.5 Litres per second,
- Grade of box gutters can be plotted at 1:200,1:150, 1:100 and 1:40,
- The depth of a sump with a high-capacity overflow must be sized using the general method and no sump/high-capacity combination shall be less than 150 mm in depth,
- Length of a sump with a high-capacity overflow is always 600mm,
- Length of a sump with a side overflow device shall not be less than 400mm,
- The width of any sump shall be equal to the width of the box gutter,
- Rainheads shall be left open above the overflow weir, inverted pops, Ned Kelly slots, round holes and vertical chutes or ducts are not deemed-to-satisfy solutions,
- Overflow devices must discharge to the atmosphere and be clear of neighbouring properties and public areas,
- Box gutters must be straight without a change of direction and discharge at the downstream end without a change in direction (i.e. not to the side),
- The box gutter sole width must not be reduced towards the outlet without a proportional increase in depth, the width of the gutter must not reduce to less than the minimum width at which it was designed (i.e. if designed at 200 mm sole width, gutter must not reduce to less than 200mm in width),
- Sumps and rainheads must be fixed and fully sealed to the box gutter,
- All box gutters must incorporate provision for expansion; where the distance between fixed points exceeds 6 metres; and at appropriate intervals for the material and situation as prescribed by the standard,
- No part of the outlet is above the sole of the sump or rainhead, and
- Lap joints of box gutters to have 25mm laps sealed and fastened in the direction of fall.

NOTE: some requirements of HB 39 conflict with the requirements of AS/NZS 3500.3, in these situations the requirements of AS/NZS 3500.3 shall be used.

Image 1: Examples of **non-DtS** box gutter Installations

Image 1 depicts 3 examples of non-DtS box gutter Installations. Designs such as these can only demonstrate compliance with the Performance Requirements of the PCA through the Performance Solution process.

Deemed-to-Satisfy requirements for a box gutter support system

Box gutter support systems shall be designed and manufactured to support the entire weight of the gutter and sumps when full of water, and a trafficable load at any point in the gutter and sumps. For guidance on vertical load testing refer to AS/NZS 2179.1

The sides of each box gutter must have adequate structural strength so that water pressure will not cause deformation.

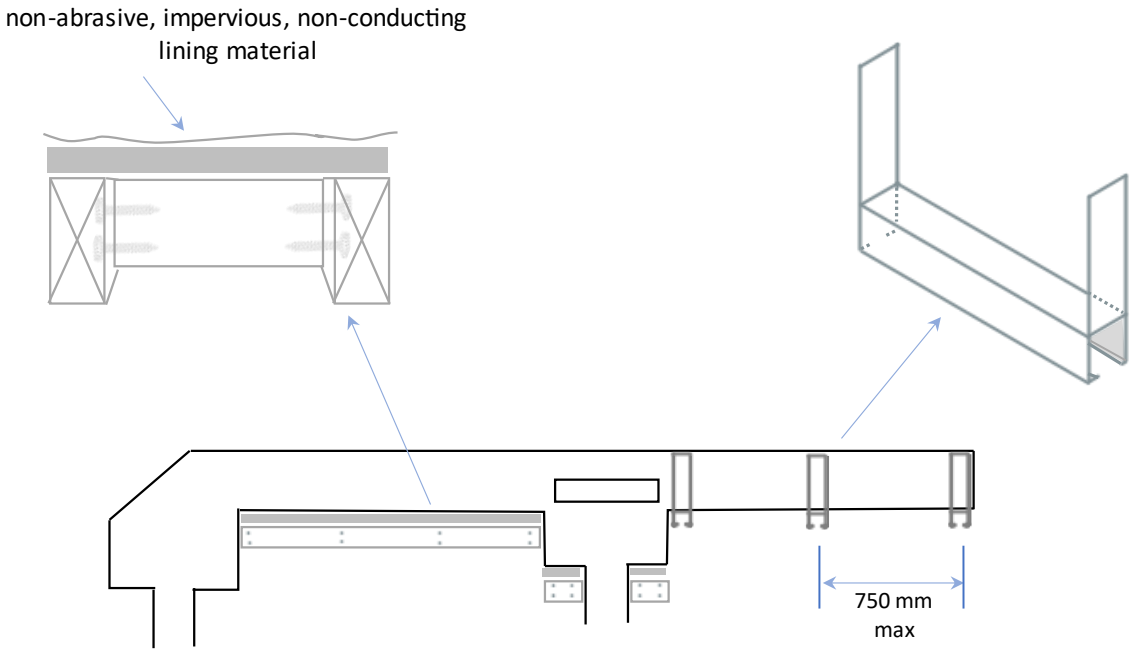
The box gutter support system must be fabricated from a material that is compatible with the box gutter or alternatively, the gutter must be protected against corrosion from an incompatible support material, or where exposed to a corrosive environment. The support system must be resistant to UV degradation and be securely attached to the building structure.

There are two types of DtS box gutter support methods that are available in the standard. These are:

- **Continuous support system -** where the box gutter is supported by multi-ribbed metal roof sheeting or other sheet type material. The support system must be continuous across the full length and sole width of the box gutter. The support of the sheet material must be fit for its intended purpose. Incompatible sheet materials may be used provided the contact surfaces are lined with a non-abrasive, impervious, non-conducting material. Continuous support systems are suitable for all gutter sole widths.

- **Discontinuous (bracket) support system** - where the box gutter is supported by brackets positioned at stop ends, either side of the sump and rainheads. The bracket material must be compatible with the box gutter and located at intervals not exceeding 750mm. Discontinuous support system can only be used for box gutters having a sole width less than 450mm.

Figure 2 provides an example of both types of box gutter support systems.



EXAMPLE OF CONTINUOUS SUPPORT

- Continuous support systems shall be used on sole widths of more than 450 mm
- Where incompatible materials are used (e.g., treated timber), the contact surfaces shall be lined with a non-abrasive, impervious, non-conducting material

EXAMPLE OF DISCONTINUOUS SUPPORT

- Discontinuous support brackets shall only be used on sole widths of 450 mm or less.
- Brackets shall extend across the sole width of the gutter.
- Brackets shall be located at stop ends, both ends of sumps, rainheads and intervals of not more than 750 mm.

Figure 2: Example of box gutter with continuous and discontinuous support.

Deemed-to-Satisfy requirements for box gutter overflow provision

Overflow devices are critical to a box gutter installation. Failing to install appropriately sized and positioned overflow devices can lead to serious damage to buildings and contents, often resulting in high-cost insurance claims.

The Plumbing Code of Australia (PCA) Vic Part E3 sets out the Performance Requirements to safeguard people from illness, injury or loss (including loss of amenity) due to the failure of a roof drainage installation.

Compliance with these requirements can be demonstrated through either a Performance Solution or a deemed-to-satisfy solution, however, roof drainage systems that are designed and installed in accordance with AS/NZS 3500.3 and SA HB:39 are automatically deemed-to-satisfy these requirements.

Where a Performance Solution is used as the compliance pathway, the solution must demonstrate that the box gutter's functionality is at least equivalent to it's deemed-to-satisfy alternative. This will ensure that the box gutter, downpipe, and overflow sizing has sufficient hydraulic capacity and freeboard to prevent wind driven spillages and overtopping from occurring within the building's footprint in the event of a total downpipe blockage.

Rainhead overflow provisions

To ensure that adequate overflow provision is made, and any surcharge is accommodated, the overflow weir of the rainhead must be the full width of the rainhead with the height of the weir positioned 25mm below the box gutter sole, and be fully open above the weir at the front of the rainhead.

Figure 3 shows an example of a rainhead with a weir located a minimum of 25mm below the sole of the box gutter.

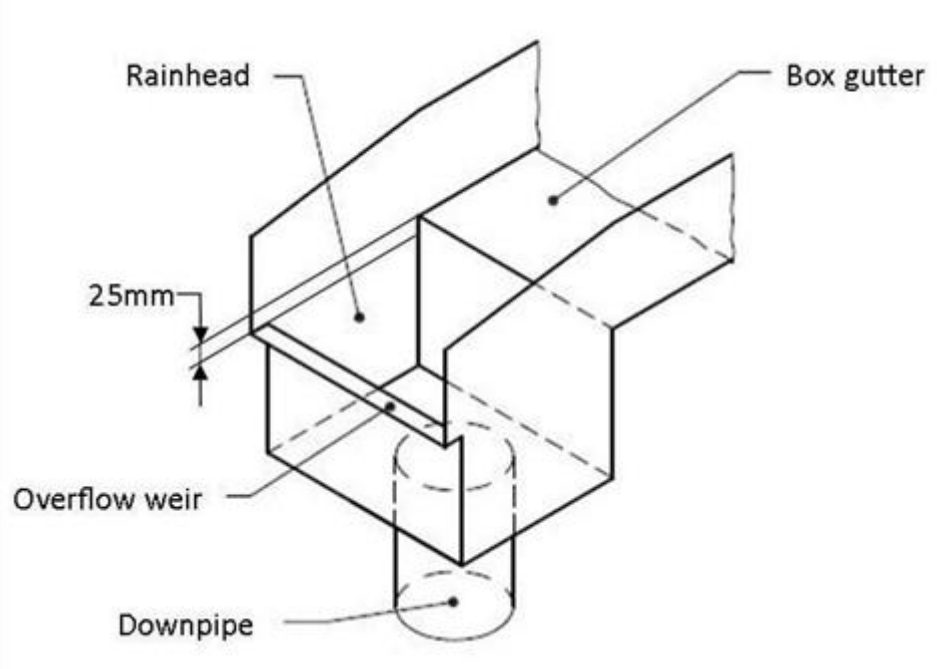


Figure 3: Example of a box gutter with a rainhead overflow provision. referenced from AS/NZS 3500.3 Figure 3.7.3 (a).

Sumps and overflow provisions

Box gutter sumps must incorporate either a side duct/channel overflow, or a high-capacity overflow device. A side overflow device is typically associated with an internal box gutter alongside a parapet wall. In the event of total or partial blockage of outlets or downpipes, the overflow device must discharge to atmosphere and remain within the property that it serves. The location of the discharge should be chosen so as to not cause a nuisance or damage to the property.

The size of the overflow device must be calculated in the accordance with the general methods prescribed by the AS/NZS 3500.3.

Figure 4 depicts an example of a side overflow device.

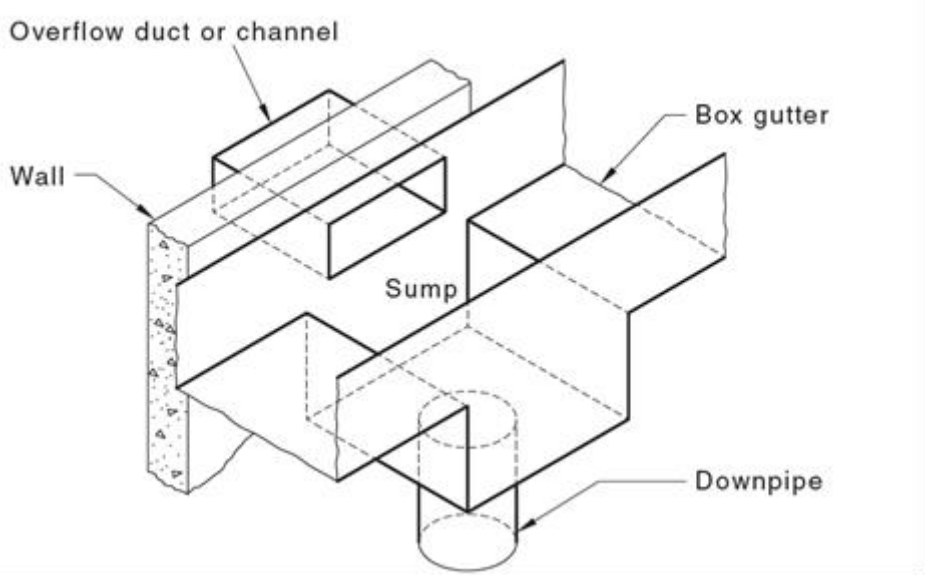


Figure 4: Example of box gutter design fitted with a sump and side overflow provision, *referenced from AS/NZS 3500.3 Figure 3.7.3 (b).*

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Figure 5 depicts an example of a sump with a high-capacity overflow device. Where this type of overflow is used the sump must be 600mm in length. The depth of the sump and the overflow weir height must be calculated in the accordance with the general method prescribed by the AS/NZS 3500.3. Sumps fitted with a high-capacity overflow device shall have a minimum depth of not less than 150mm.

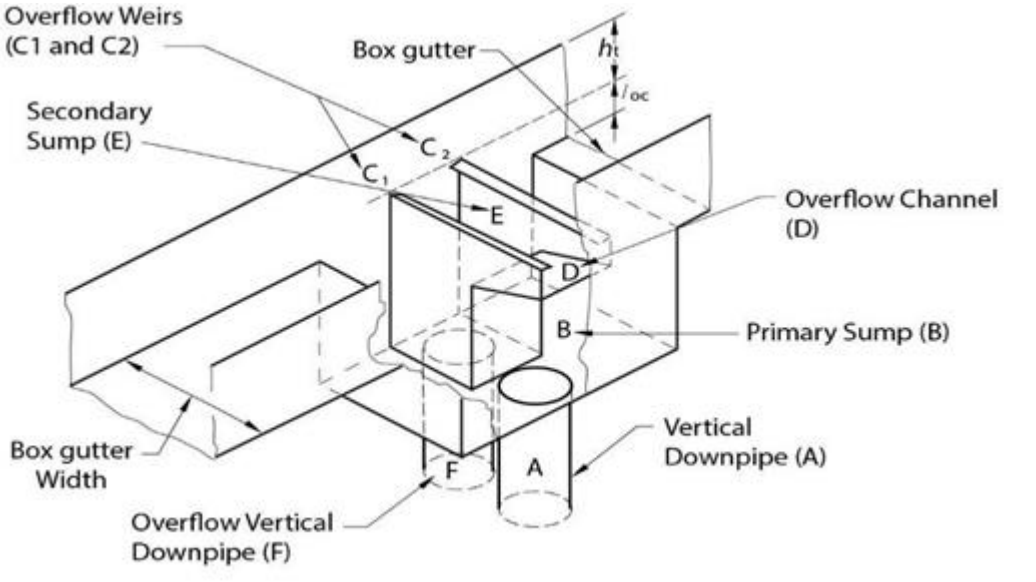

Figure 5: Example of box gutter design fitted with a sump and high-capacity overflow provision, *reference AS/NZS 3500.3 Figure 3.7.3 (c).*

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Deemed-to-Satisfy design requirements for expansion provision in box gutters

Roofing materials expand and contract due to temperature variations and this can cause unsightly oil-canning and structural problems in the roof drainage material if the installation does not cater for the movement. The range of expansion required will depend on the type and the thickness of the material being used.

For DtS guidance on the maximum lengths between expansion joints and minimum expansion space refer to clause 4.3 of AS/NZS 3500.3 and figure 6 below.

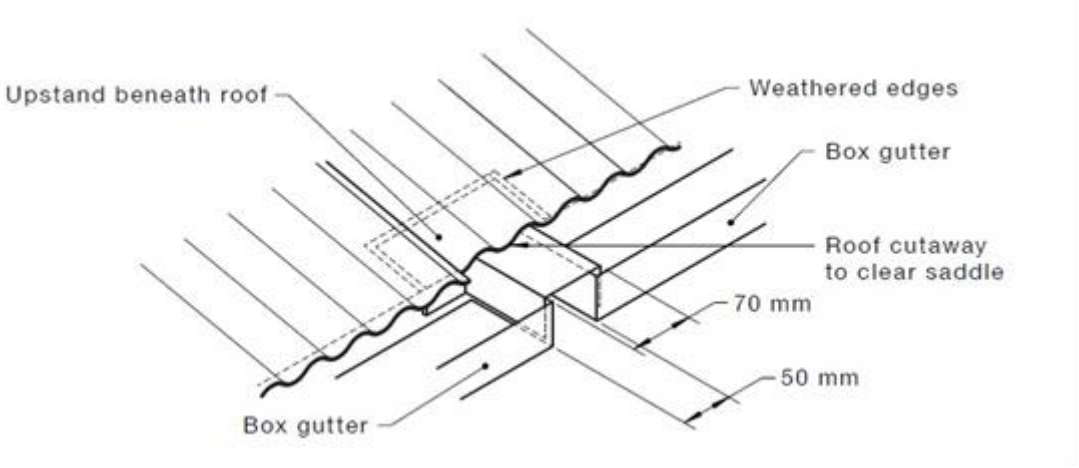

Figure 6: Example of box gutter design with provision for 50mm expansion space, referenced from HB 39 Figure 5.3.2 (B).

Collaboration on the design of box gutters

Designers, architects and building surveyors must ensure that approved designs can satisfy the Performance Requirements of the PCA. This means where design parameters of AS/NZS 3500.3 and HB 39 cannot be adhered to a Performance Solution must be agreed between the relevant stakeholders prior to work commencing. During construction, if designs are found to be outside of the DtS parameters, the roof plumber should consult with the Relevant Building Surveyor and builder as a Performance Solution may need to be developed and an amended Building Permit may need to be issued.

For example, where a roof frame does not readily allow the installation of a DtS compliant box gutter (due to the location or layout of roofing members) the alteration of any structural element of the building will require an approved building permit (new or amended) to be obtained prior to the structural alteration work commencing.

Image 2 (below) is a typical example of a box gutter that is not DtS compliant due to the change of direction. Collaboration with the designer, building surveyor, builder and plumber is necessary to ensure that all parties are aware of how the work is to be certified prior to the installation commencing.

Image 2: Depicts a box gutter with a change of direction.

Further information about box gutters

Further information on the deemed-to-satisfy design of box gutters systems is available from the VBA website through the following links:

- PDF- Common Roof Drainage Enquiries & Faults – Box Gutters
- WEBINAR- Common Roof Drainage Enquiries & Faults – Box Gutters

Compliance with the Performance Requirements of the PCA can be demonstrated through the Performance Solution process. Refer to Part A2G2 of the PCA for guidance on how a Performance Solution can be achieved. Further information is available on the VBA's website.

Related Documentation

- Building Act 1993
- Building Regulations 2018
- National Construction Code, Volume 3, Plumbing Code of Australia (PCA) 2022: VIC Part E3
- AS/NZS 3500.3:2021 Part 3: Stormwater Drainage
- HB 39:2015 Amd 1:2021 Installation code for metal roofing and cladding
- Plumbing Practice Note RP-01: Regulatory Framework
- Plumbing Practice Note RP-03: Eaves Gutters
- Plumbing Practice Note RP-04: Downpipes
- Plumbing Practice Note RP-05: Flashings

List of Amendments

- Updated to reference NCC 2022
- New figure added to expand on support requirements
- Reconfigure and simplify content to improve readability

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