Plumbing Practice Note RP-02: Box Gutters

This Practice Note provides guidance on the requirements for the installation of box gutters.

The content below provides guidance on:

- Defining a box gutter
- Collaboration on the design of box gutters
- 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
- Other considerations when installing a box gutter

For guidance on regulatory framework, please refer to Plumbing Practice Note RP-01: Regulatory Framework for Roof Plumbing.

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 (Act), the Plumbing Regulations 2018 (Regulations) or the Plumbing Code of Australia 2019 (PCA).

- **AS -** Australian Standard
- **AS/NZS -** Australian/New Zealand Standard
- **DtS –** Deemed-to-Satisfy
- **PCA -** National Construction Code 2019 Volume Three - Plumbing Code of Australia

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 acceptable, provided the effective area of the gutter is appropriately sized for the roof catchment area in accordance with AS/NZS 3500.3 Plumbing and drainage Part 3: Stormwater drainage.

Box gutters must satisfy the requirements of the Regulations and the PCA. Practitioners must ensure the design, construction, installation, replacement, repair, alteration and maintenance of box gutters comply with AS/NZS 3500.3 and HB 39. Typical examples of box gutters are shown in Figure 1.

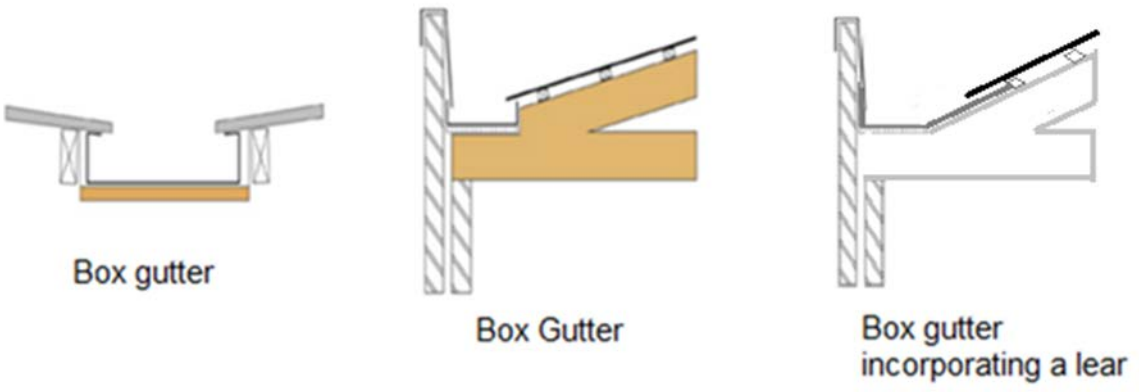

Figure 1: Typical examples of box gutters

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.

Collaboration on the design of box gutters

Designers, architects and building surveyors should ensure approved drawings are in accordance with the design parameters of AS/NZS 3500.3 and include adequate information to enable the builder and plumber to comply.

Builders, site supervisors and project managers must ensure that the building is constructed in accordance with the approved design. Plumbers must ensure that installation of box gutter systems comply with AS/NZS 3500.3 and HB 39.

Where a roof frame does not readily allow the installation of a compliant box gutter (due to the location or layout of roofing members) the issue should be referred to the designer, building surveyor and/or builder.

Where the installation of the box gutter involves the removal or alteration of any structural element of the building, then a building permit is required.

Image 1: Non-compliant box gutter (due to change of direction)

Image 1 on the previous page is a typical example of a non-compliant box gutter installed with a change of direction. Collaboration with the designer, building surveyor and/or builder is necessary to enable compliance with AS/NZS 3500.3, prior to installation.

Design and installation parameters for box gutters

The following design and installation parameters must be achieved to satisfy the requirements of AS/NZS 3500.3. Box gutter must have:

- a minimum sole width of 200mm for domestic Class 1 buildings and 300mm for other building classes,
- a minimum depth of 75mm at the high end,
- the sole must be smooth to prevent permanent ponding with the gradient between the range of 1:40 to 1:200,
- discharge at the downstream end without change in direction (i.e. not to the side),
- be straight (without change of direction),
- the box gutter must be sealed to the rainhead or sump,
- the sole width must not be reduced towards the outlet without a proportional increase in depth,
- where sarking is installed, it must be a min 25mm into the box gutter,
- 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.

Figure 2: Installation example of a box gutter

Requirements for a box gutter support system

The box gutter support system must be fabricated from a material that is compatible with the box gutter and be protected against corrosion where exposed to a corrosive environment. The support system must be resistant to UV degradation, be securely attached to the building structure and support the entire weight of the gutter and sumps when full of water as well as a trafficable load at any point in the gutter and sumps.

There are two types of DtS box gutter support systems plumbing practitioners must use in an installation. These are:

- **Continuous support system -** where the box gutter is supported by multi-ribbed metal roof sheeting or material compatible with the box gutter. The support system must be continuous across the full length and sole width of the box gutter.

- **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 3 provides example of both types of box gutter support systems.

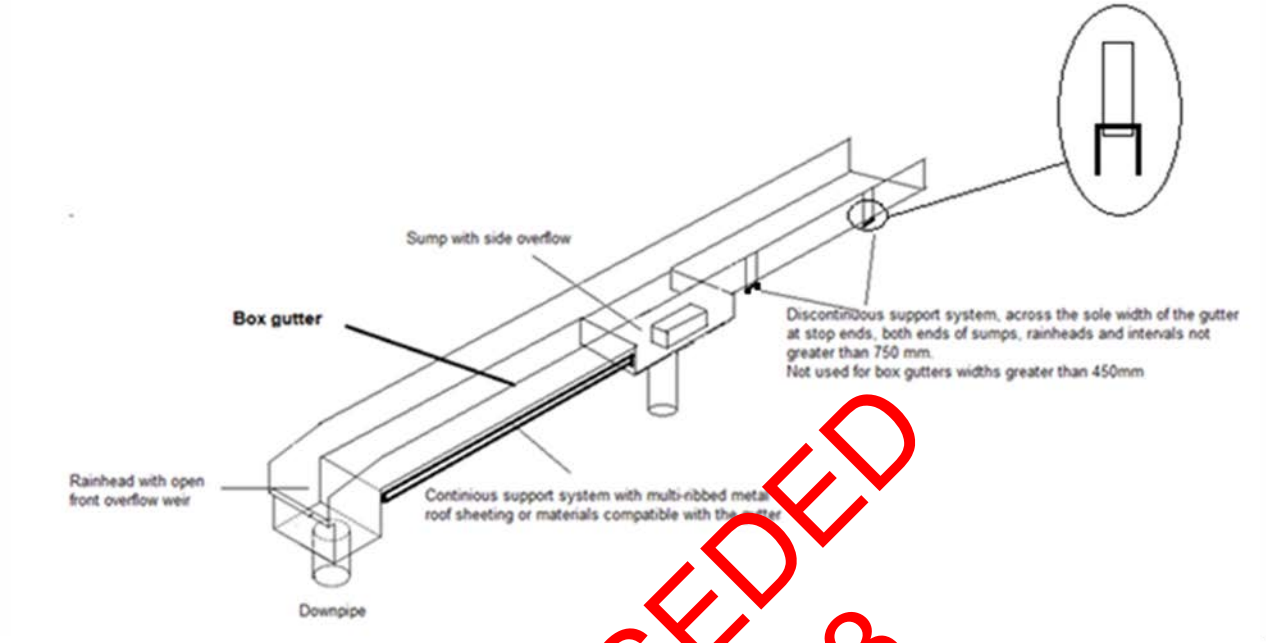

Figure 3: Example of box gutter with continuous support and with support brackets

Overflow provisions in box gutters

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.

Roof drainage systems need to be designed and installed with appropriate overflow provisions. Box gutters sizing must be designed in accordance with AS/NZS 3500.3, which include 30mm allowance for freeboard to prevent wind driven spillages. Plumbers need to calculate the hydraulic capacity of a box gutter and install the overflow provisions in accordance with the requirements of AS/NZS 3500.3.

Box gutters must have independent overflow provision discharging to atmosphere.

Design

Roof plumbing practitioners must consider at the design stage, how the box gutter discharges at the downstream end. To comply with the DtS requirements, the box gutter must discharge to either:

- a rainhead,
- a sump with a side overflow device, or
- a sump with a high-capacity overflow device.

Once this has been established, the hydraulic capacity of the overflow device needs to be calculated, ensuring that it's not less than the design flow for the associated gutter outlet. Practitioners need to position the overflow device ensuring the discharge is contained within the property's perimeter. Plumbers must be mindful to size the overflow device to AS/NZS 3500.3 with an Average Exceedance Probability (AEP) of 1% (ARI 100 year).

Rainhead overflow provisions

To ensure that adequate overflow provision is made, and any surcharge is accommodated, the overflow weir of the rainhead must be sized to AS/NZS 3500.3 and be fully open above the weir at the front of the rainhead. Overflow devices that discharge from a rainhead do not require an increase in depth of flow in the box gutter.

Figure 4 shows an example of a rainhead with a weir located a minimum of 25mm below the sole of the box gutter.

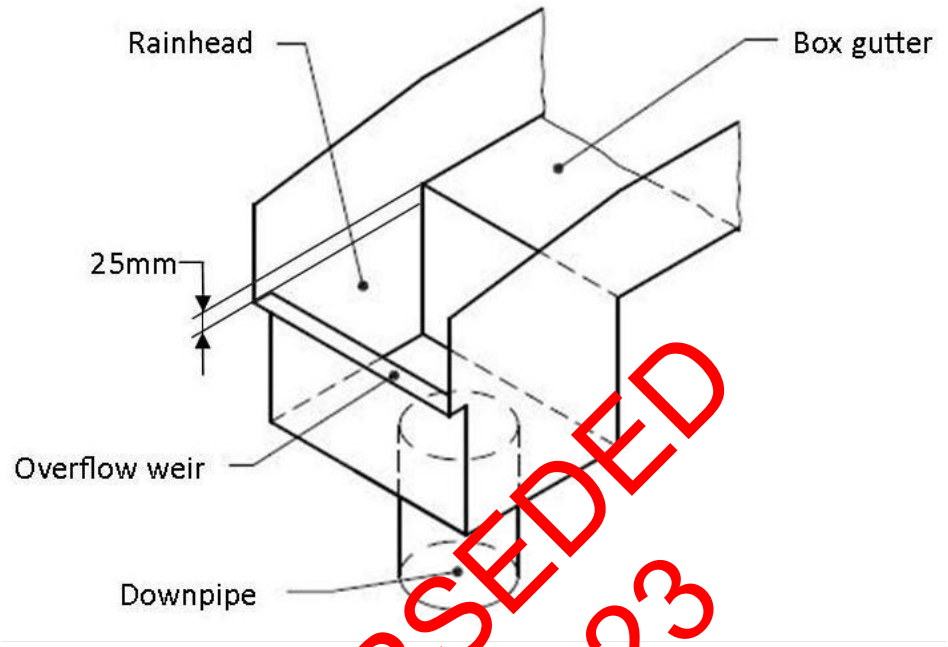

Figure 4: Example of a box gutter with a rainhead overflow provision. *referenced from AS/NZS 3500.3 Figure 3.7.3 (a).*
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Sumps and overflow provisions

Box gutter sumps must have either a side duct/channel or a high-capacity overflow device. Side overflow device is typically an overflow device associated with an internal box gutter alongside a parapet wall. The overflow device must discharge all roof water clear of a building due to total or partial blockage of outlets, downpipes, or stormwater drains.

To prevent damage to a building, the overflow device must discharge to atmosphere on the property that it serves. The size of the overflow device must be calculated in the accordance of AS/NZS 3500.3.

Figure 5 illustrates an example of a side overflow device. In some instances, the layout of a sump/side overflow device may have to be varied due to building constraints.

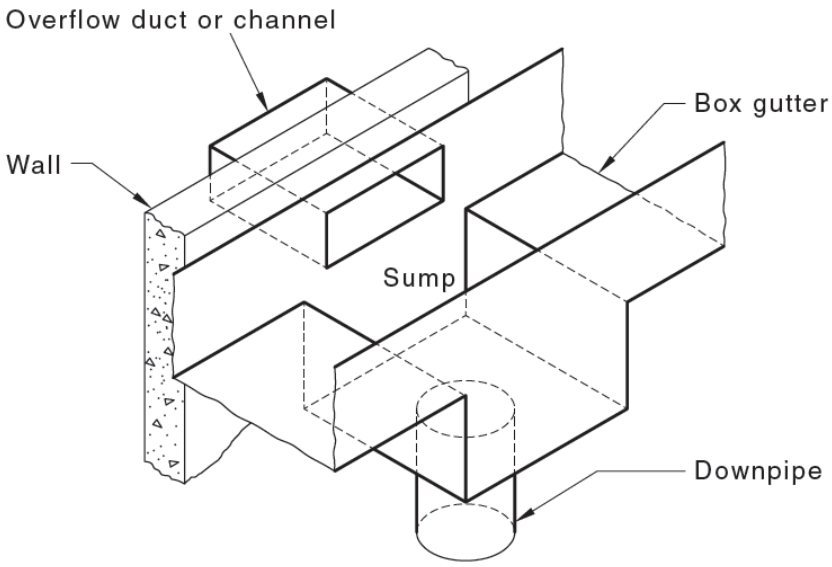

Figure 5: Example of box gutter design fitted with a sump and side overflow provision, *referenced from AS/NZS 3500.3 Figure 3.7.3 (b).*

Figure 6 shows an example of a high-capacity overflow device. The sump must be sized to AS/NZS 3500.3 with a minimum length of 400mm and with a minimum depth of not less than 150mm when fitted with a high-capacity overflow device and when either one or two box gutters enter the sump.

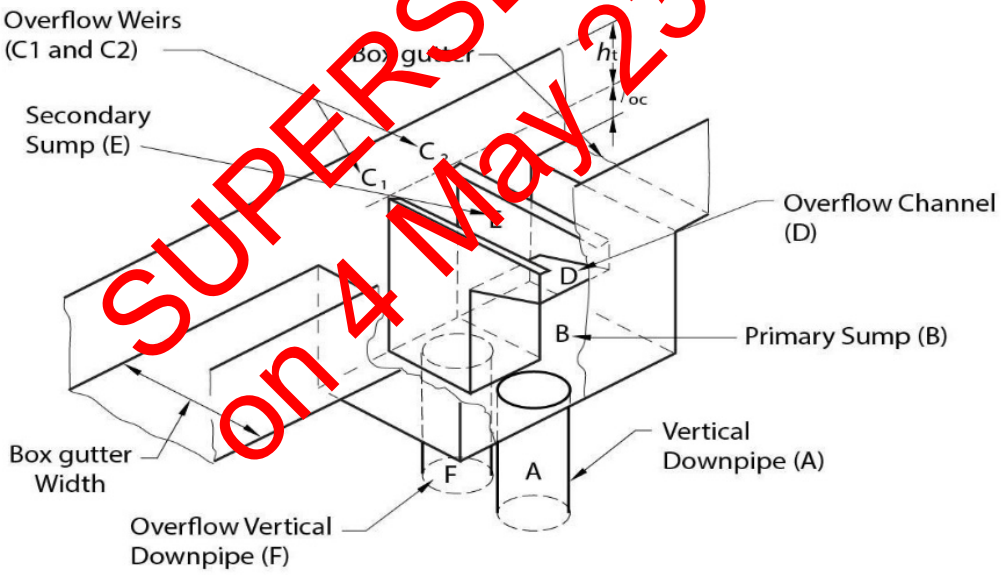

Figure 6: Example of box gutter design fitted with a sump and high-capacity overflow provision, *reference AS/NZS 3500.3 Figure 3.7.3 (c).*

Expansion provision for box gutters

When installing a box gutter, plumbers must ensure that there is adequate provision for expansion, by considering:

- the material type (including the thickness of the material) being used, and
- if the gutter is free to move at both ends or only at one end.

Roofing materials expand and contract due to temperature variations therefore, practitioners must ensure expansion provisions are applied to their metal roofing installation. For expansion provision on box gutters, practitioners must ensure the maximum lengths between expansion joints and minimum expansion space are in accordance with Section 4 of AS/NZS 3500.3.

Synthetic rubber and joint saddle, as pictured in Figure 7 and Figure 8, are two types of acceptable expansion joints shown in SA HB 39.

When installing synthetic rubber (Figure 7), the expansion joint must be installed at the highest point of the box gutter and be fully supported by the gutter profile to prevent damage to the joint.

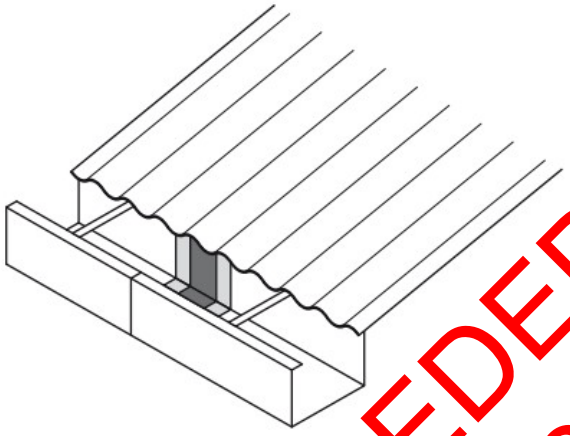

Figure 7: Example of box gutter design with an expansion joint using a flexible rubberised membrane, *referenced from HB 39 Figure 5.3.2(c).*

When installing an expansion joint saddle (Figure 8) the minimum expansion space is 50mm, as per SA HB 39.

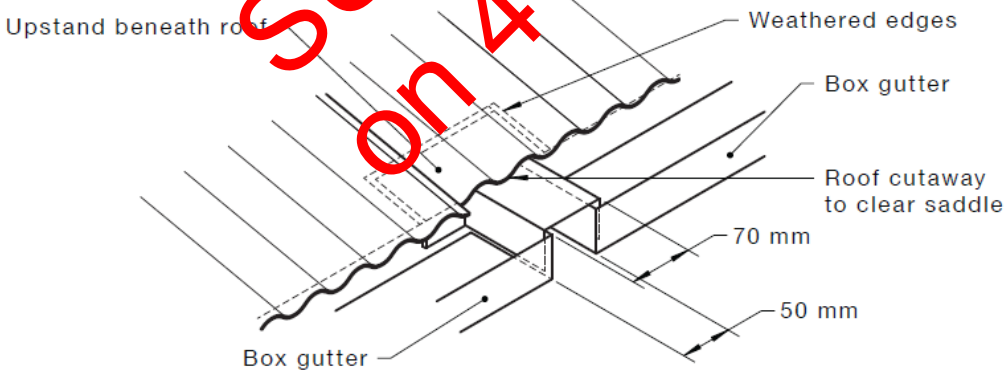

Figure 8: Example of box gutter design with provision for 50mm expansion space, *referenced from HB 39 Figure 5.3.2 (B).*

Other considerations when installing a box gutter

Prior to installation, the building plans and designs must be checked to ensure that all internal gutters comply with AS/NZS 3500.3 and HB 39.

It is important that plumbers consider the following prior to a box gutter installation:

- confirm that the box gutter design caters for the Average Exceedance Probability (AEP),
- if it appears that any box gutter will not comply, discuss the matter with the builder/building surveyor, architect, or designer with a view to amending the design,
- ensure that the overflow measures are designed to protect buildings from internal water damage, and
- confirm that box gutters are designed and sized in accordance with AS/NZS 3500.3.

Compliance with the Performance Requirements of the PCA can be met by a Performance Solution. Refer to Part A2 of the PCA for guidance on how a Performance Solution can be achieved. Further information is available on the VBA's website.

Related Documentation

- Plumbing Regulations 2018
- National Construction Code 2019 Volume Three - Plumbing Code of Australia (Victorian Variation, Section F - Stormwater drainage systems)
- AS/NZS 3500.3 Plumbing and drainage Part 3: Stormwater Drainage
- SA HB 39: Installation code for metal roof and wall cladding
- SA HB 114: Guidelines for the design of eaves and box gutters
- Practice Note RP-01: Regulatory Framework
- Practice Note RP-03: Eaves Gutters
- Practice Note RP-04: Downpipes
- Practice Note RP-05: Flashings

Contact Us

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