DAM BUSTER®

Achieve Compliance & Conformance with

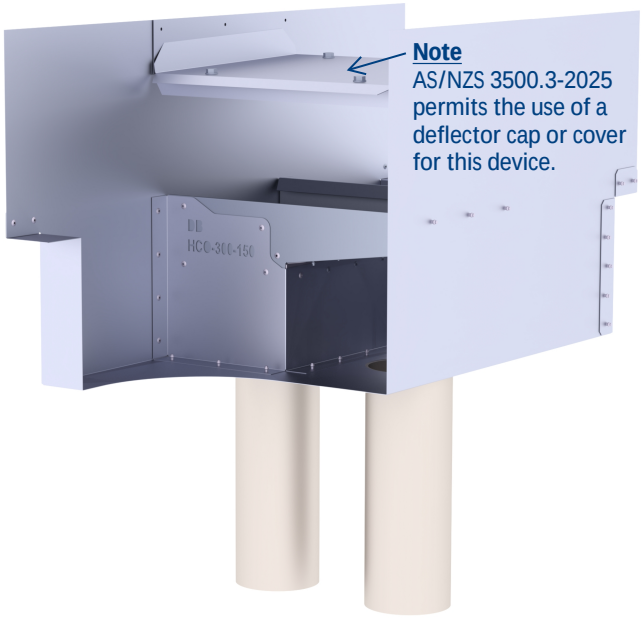
Dam Buster® Products

Deemed-to-Satisfy Box Gutter Overflow Devices to AS/NZS 3500.3

Version 1.0 (1 August 2026)

OR - Open Rainhead
HCO - Sump / High Capacity Overflow device
SSO - Sump / Side Overflow

Dam Buster OR



Dam Buster HCO

Dam Buster SSO

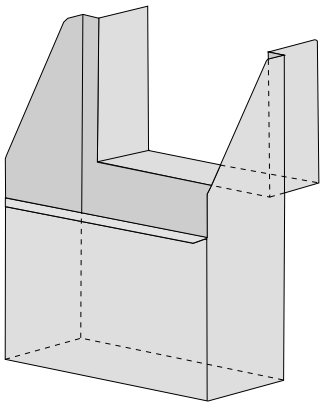
Fully compliant with AS/NZS 3500.3

"Deemed-to-Satisfy Solutions for box gutters made easy"

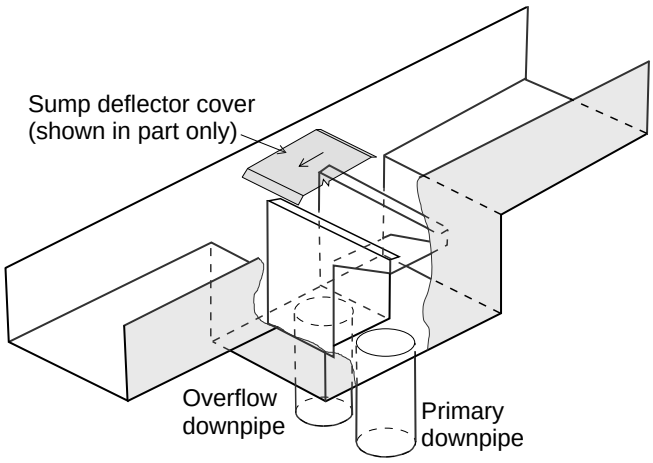
www.dambuster.com.au

Dam Buster Deemed-to-Satisfy (DtS) Box Gutter Overflow Devices

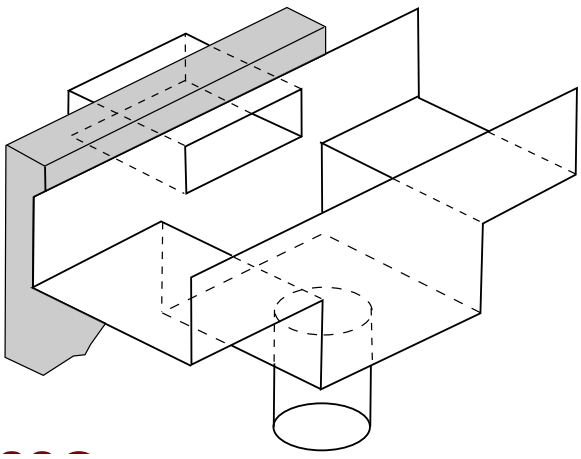
INDEX



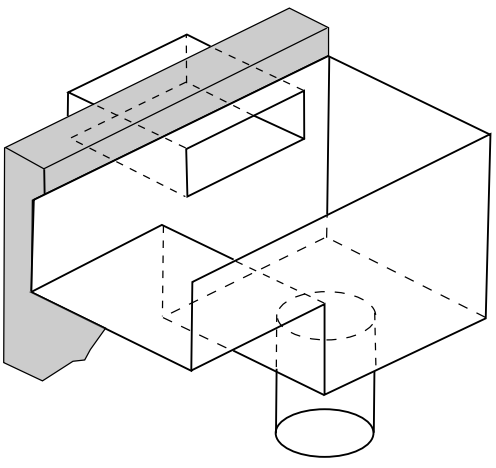
OR - Open fronted Rainhead



HCO - Sump / High Capacity Overflow Device



SSO - Sump / Side Overflow Device (two box gutters)



SSO - Sump / Side Overflow Device (one box gutter)

Dam Buster DtS Box Gutter Overflow Devices

1. Introduction

1.1 Available Dam Buster DtS Box Overflow Devices

All three Dam Buster DtS box gutter overflow devices have been designed to be fully conforming and compliant with applicable clauses and figures in AS/NZS 3500.3 ('3500.3). These products are high quality, high precision, pre-engineered and economical prefabricated products. The devices are labelled as follows:

- Dam Buster **OR** - Open Rainhead to 3500.3
- Dam Buster **HCO** - High-Capacity Overflow (sump) device to 3500.3
- Dam Buster **SSO** Sump / Side Overflow to 3500.3 to suit 1 or 2 (as depicted) box gutters

The Dam Buster OR (Open Rainhead) mirrors the beneficial design features of the original Dam Buster rainheads, except there is no front cover / vertical overflow chute. Refer to section 2 for further details.

Both the Dam Buster HCO and SSO devices also mirror the requirements of 3500.3, however rather than being custom designed and fabricated for each and every application (as is the long-standing industry practice), they now leverage Dam Buster's highly innovative, systemized approach which is designed to greatly simplify product selection and use for the customer, and also to facilitate much faster, more cost-effective, modern manufacturing methods. The various models carry clearly marked Dam Buster branded identification and model details via a serial number sticker to provide traceability and quality assurance.

1.2 Dam Buster OR – Open Rainhead

As noted above, the Dam Buster OR mirrors the original Dam Buster rainhead, however, the front cover / vertical overflow chute is omitted and some of the internal components have been adjusted and augmented in the Colorbond versions to ensure seamless coverage of colour for aesthetic purposes.

The main (normal flow) compartment of the original Dam Buster rainhead (incorporating a vertical overflow chute) is already sized in accordance with 3500.3. The Dam Buster OR is also sized in accordance with 3500.3, however, the sizing is strictly limited to 3500.3 (for example, design capacities for an 80mm DIAM DP are not provided).

Although the original Dam Buster rainhead is aesthetically superior to the OR, it is recognised that in some instances, the OR may be preferred due to its lower cost and DtS compliance pathway in some jurisdictions.

Refer to section 3 for the available Open Rainhead sizes and the design method.

Dam Buster DtS Box Gutter Overflow Devices

1. Introduction (cont.)

1.3 Dam Buster OR, SSO & HCO Sump Devices

Dam Buster has developed proprietary software (refer to section 1.4) to allow all DtS devices to be quickly and easily designed by the customer within the limitations of 3500.3. However, unlike other software packages and applications which only generate sizing specifications, this software automatically selects the available Dam Buster prefabricated products in the appropriate sizes, therefore enabling the customer to simply order the necessary products from their chosen Dam Buster supplier. No custom design or fabrication will be required.

Please note that there may not always be a prefabricated Dam Buster device available to suit every design application, however, the Dam Buster OR, HCO and SSO standard sizing have been prepared to suit the vast majority of designs.

In the (very unusual) event that a design application is outside of what can be provided by a Dam Buster OR, HCO or SSO device, the customer can use the 'Custom' Design software (refer below) and then arrange for the device to be individually manufactured by their preferred fabricator. Note that that custom design of Dam Buster's products may also be possible (typically on an additional fee basis), and advice should be sought from Dam Buster regarding custom designs.

Refer to section 3 for design of the OR.

Refer to section 4 for design of the HCO.

Refer to section 5 for design of the SSO.

1.4 Dam Buster Design Software

Dam Buster's design software is available at www.dambusterdesign.com.au under a subscription basis. The various Calculators provided will expand over time with future releases of the software.

All Calculators are intuitive and easy to use both on PC and mobile platforms. Each of the Calculators for the three DtS box gutter overflow devices comprises two design options, as follows:

Design using Dam Buster products

When this default option is selected, the Calculators design the box gutters and overflow devices to AS/NZS 3500.3 based on inputs from the user and automatically selects the most appropriate Dam Buster product (s), which can then be ordered immediately. The Calculators also adopt the practical approach of rounding up box gutter depths to the nearest 5mm.

Dam Buster DtS Box Gutter Overflow Devices

1. Introduction (cont.)

'Custom' Design

When this option is selected, the calculators design the box gutters and overflow devices strictly to AS/NZS 3500.3, but do not specify a Dam Buster product. Results are provided to the nearest mm.

In either case, users (who are typically licenced practitioners) must be alert to the fact that incorrect inputs will lead to incorrect outputs, so it is always the user's responsibility to ensure that the inputted information is correct and ultimately also that the product being selected by the calculators based on those inputs, is in fact suitable for the purpose required.

2. Box Gutter Design for DtS Devices

2.1 OR – Dam Buster box gutter design charts **may** be used

In addition to using Dam Buster's Calculator for the OR, Dam Buster's Box Gutter Design Tables may be used to design a box gutter discharging to a Dam Buster OR. Refer to Appendix A. These tables are based on the General Method of 3500.3 for a box gutter discharging to a rainhead (complying with 3500.3) and are effectively a tabulated form of Figure H.1 in 3500.3.

Figure H.1 applies for 'free flow' only. A box gutter discharging directly to a Dam Buster or DtS rainhead is 'free flow' in both the 'normal' and 'overflow' conditions, whereas the sump devices are only 'free flow' in the 'normal' flow condition. Refer to the next section for further discussion on the design of box gutters to the sump devices. Note also the design of box gutters discharging to the OR is independent of the design of the OR itself (this is not the case for the sump devices) and all upstream box gutters must also be DtS.

2.2 HCO & SSO – Dam Buster box gutter design charts may **NOT** be used

IMPORTANT: Dam Buster's box gutter design charts **MUST NOT** be used to design box gutters discharging to the DtS HCO or SSO devices. This is because unlike Dam Buster's own patented sumps, the DtS HCO and DtS SSO devices are not free flow devices; instead, the DtS devices require a fundamentally different design philosophy involving what is known as 'backwatering' in the overflow condition. In general, this means the box gutters servicing DtS HCO or SSO devices must be deeper than those servicing Dam Buster sumps for the same design flowrates.

The 3500.3 sump devices are 'free flow' in the 'normal' flow condition but NOT in the 'overflow' condition. In the overflow condition, 'backwatering' must occur in both devices (i.e. there is no longer 'free flow') in order to allow the water to rise up and flow over the overflow weirs in the HCO or through the side overflow duct in the SSO.

HCO

Dam Buster's HCO Calculator MUST be used for the design of the Dam Buster's HCO. Refer to section 4.3 for further information.

Dam Buster DtS Box Gutter Overflow Devices

2. Box Gutter Design for DtS Devices (cont.)

SSO

Dam Buster's SSO Calculator MUST be used for the SSO. Refer to section 5.2 for further information.

2.3 Design depth applies at the upstream end

Note that for all three DtS box gutter overflow devices, the design box gutter depth applies for the full length of the box gutter. In practice, because the top of the box gutter is typically level, this design depth becomes the (minimum) upstream depth, and the downstream depth is greater by the amount of fall in the box gutter. The upstream depth includes the freeboard.

2.4 Fall

Dam Buster recommends a minimum fall of 1 in 150 for box gutters wherever possible (rather than the minimum of 1 in 200 per 3500.3). One of the reasons for this is that for buildings constructed on reactive clay soil sites, differential movements could result in a loss of fall in one or more box gutters with the box gutter fall therefore becoming less than the minimum requirement. Long term creep deflections of timber members, poor attention during construction and other factors can also potentially result in some loss of the installed fall.

Dam Buster DtS Box Gutter Overflow Devices

3. Dam Buster Open Rainhead 'OR'

3.1 Available OR Sizes

Label	Name	Sizes				
		200 Series	300 Series	400 Series	500 Series	600 Series
Rainheads						
OR-www	Rainhead	OR-200	OR-300	OR-400	OR-500	OR-600
OR-www-FB	Flat Back Rainhead	OR-200-FB	OR-300-FB	OR-400-FB	OR-500-FB	OR-600-FB
Stretched Rainheads						
OR-300-www	Stretched [(1)] OR-300 Rainhead	n/a	OR-300-400	n/a	n/a	n/a
OR-300-www-FB	Stretched [(1)] Flat Back OR-300 Rainhead	n/a	OR-300-400-FB	n/a	n/a	n/a

NOTES

1. **STRETCHED** rainheads. Stretched rainheads (including the box gutter receiver, where applicable) are 'stretched' in the direction perpendicular to the box gutter. All other dimensions remain the same. For example, an OR-300-**400** is simply an OR-300 rainhead, which has been 'stretched' to accommodate a 400mm wide box gutter, rather than a 300mm wide box gutter.

3.2 Design of the Dam Buster OR

The Dam Buster OR Rainhead is sized using Table 1 below. The box gutter discharging to the OR Rainhead is sized using Dam Buster's Box Gutter Design Tables, refer to Appendix A. Dam Buster's Calculator for the OR guides the user through the design process, which is effectively a selection process.

TABLE 1 – Dam Buster Open Rainhead ('OR')

Downpipe size	Equivalent diameter	Rainhead size				
		OR-200	OR-300	OR-400	OR-500	0R-600
100 x 50	79	4.00	5.00			
90 diam.	90	4.70	6.50			
100 x 75	97	5.00	7.30	8.00		
100 diam.	100	5.00	7.60	8.80	8.80	
100 x 100	112		8.80	12.00	12.00	
125 diam.	125		9.50	14.20	15.40	15.90
150 x 100	137			15.40	15.40	16.00
150 diam.	150			16.00	16.00	16.00

Refer note (i)

Refer note (ii)

Maximum permissible flow rates (litres / sec)

NOTES

(i) Smaller downpipes, although not recommended, may be used, however the hydraulic capacities for next smallest rainhead with the same downpipe must be adopted.

(ii) These DP and rainhead size combinations are not possible

4. Dam Buster High-Capacity Overflow ('HCO')

4.1 Description

The Dam Buster HCO is prefabricated in a range of standard sizes, however, the design height of the overflow weirs above the sole of the box gutter, **'Loc'**, is set in the factory based on computations using the General Method of 3500.3. The 'Loc' value is therefore determined by a suitable expert e.g an engineer, or else via use of the Dam Buster DtS design software.

The height of the device above the sole of the box gutter receivers is 200mm for the 300mm wide HCO series, and 240mm for all other HCO series. If required, the device is cut down on site by the roof plumber to match the downstream depth of the box gutters. Where the design has been performed by the Dam Buster DtS design software and that information supplied to the authorised Dam Buster licensee fabricator, crease folds on the HCO will also identify the minimum side wall heights of the sump.

The two piece (removable) Sump Deflector Cover (provided with each HCO) and referenced under Note 4 of clause 3.7.7.2 *Operation* (of Overflow devices) in AS/NZS 3500.3:2025 (although not depicted in Figure 3.7.3 (c) or Figure H.7), is then installed on site by the roof plumber. This Sump Deflector Cover is designed such that it can be suspended via rivets and/or tabs to the side or the top edge of the sump walls. Refer to Appendix C drawings for detailed Sump Deflector Cover installation information. The Sump Deflector Cover is always positioned such that it is located above design water level in the overflow condition (refer to Design for a detailed explanation). The Sump Deflector Cover therefore has no hydraulic impact on the operation of the device, but rather simply deflects otherwise nuisance flow and debris from regularly entering the sump overflow compartment from roof sheeting, flashings or direct rainfall into the sump, either side of the weirs.

4.2 Available Dam Buster HCO Sizes

Available Standard Sizes					
Label	**300mm wide**	**400mm wide**	**450mm wide**	**500mm wide**	**600mm wide**
HCO-www-ddd	HCO-300-150	HCO-400-150	HCO-450-150	HCO-500-150	HCO-600-150
	HCO-300-200	HCO-400-200	HCO-450-200	HCO-500-200	HCO-600-200
	HCO-300-250	HCO-400-250	HCO-450-250	HCO-500-250	HCO-600-250

NOTES

1. **BOX GUTTER RECEIVERS -** All Dam Buster HCO's have two box gutter receivers. If there is only one box gutter, the roof plumber should cut off the unused 50mm long box gutter receiver (if required) and provide a stop end (to the sump or the end of the unused box gutter receiver).

4. Dam Buster High-Capacity Overflow ('HCO') cont.

4.3 Design

As noted in section 2.2, Dam Buster's Calculator MUST be used for the design of the Dam Buster's HCO. This is because the software ensures the gap between the top of the internal weirs and the underside of the sump deflector cover is sufficient to ensure the cover cannot interfere with the water flow in the overflow condition.

IMPORTANT – ADDITIONAL DESIGN REQUIREMENT FOR HCO (IN ADDITION TO AS/NZS 3500.3)

In accordance with the General Method, in the overflow condition, the minimum design depth for the box gutter is equal to '**ht**' + '**Loc**', where

- **ht** is determined from Figure H.8 (based on the box gutter with the larger flow)
- **Loc** is determined from Figure H.6 (a) (also based on the box gutter with the larger flow)

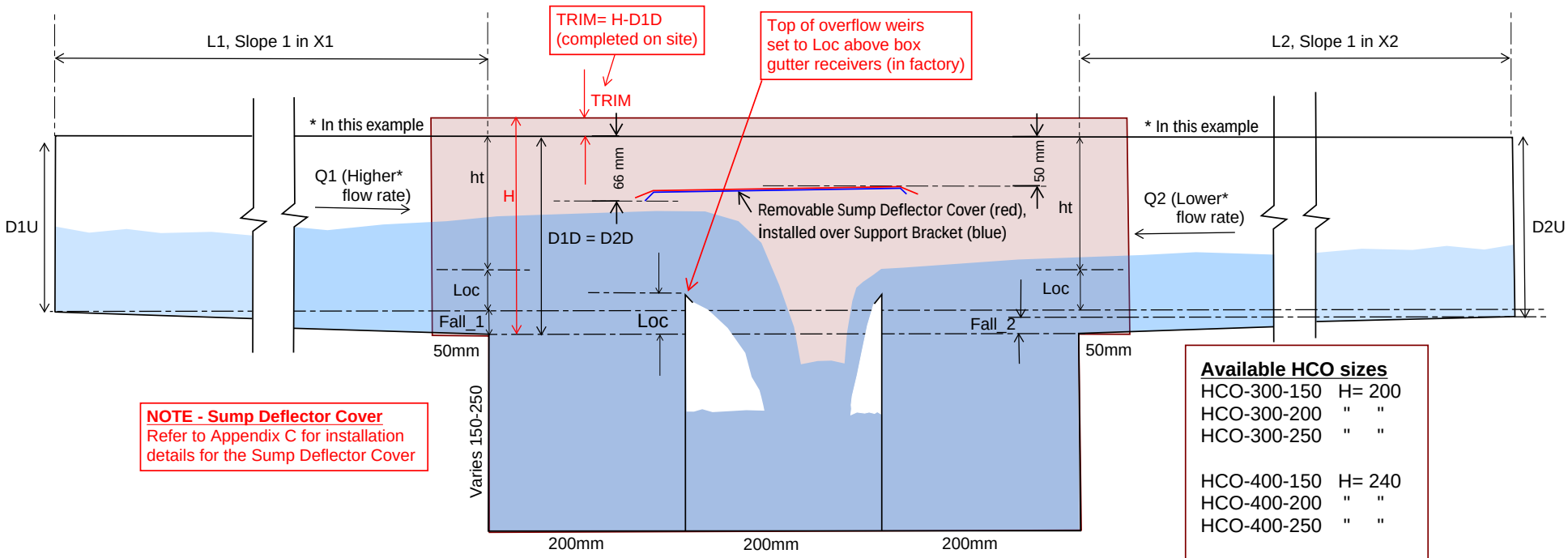
'**ht**' comprises the water depth above weirs plus a freeboard allowance. AS/NZS 3500.3-2025 incorrectly states the freeboard is 30mm. This is incorrect because the 30mm only applies in one case, the overflow condition for the Sump / Side Outlet. Based on a 1999 paper by Ralph Jones and Eugene Kloti titled '*A High-Capacity Overflow Device for Internal Box Gutters of Roofs',* the freeboard for the HCO is actually 45mm in the overflow condition. As indicated in the diagrams in Appendix C, the lowest point in the Sump Deflector Cover Support Bracket is 66mm below the top of the box gutter, this being an additional 21mm below the freeboard allowance. Dam Buster has adopted the approach that the downstream box gutter depth must be at least 30mm greater than the design box gutter depth of (Loc + ht) i.e. the downstream box gutter depth must be at least (Loc + ht + 30mm). This will ensure that there is always adequate clearance between the top of the overflow weirs and the underside of the Support Bracket such that the hydraulic operation of the device is not impaired by the Sump Deflector Cover or its Support Bracket.

In practice, because the design depth applies at the upstream end, this requirement for the downstream box gutter depth is achieved by ensuring that the Fall is at least 30mm. For very short box gutters (less than 1.2m long), it may also be necessary to increase the upstream depth slightly to ensure the box gutter fall is not greater than the maximum permitted fall specified in AS/NZS 3500.3 of 1 in 40. Note that where the Dam Buster Calculator tool is used, the Dam Buster HCO will automatically take this design requirement into account.

4.4 Ordering

Dam Buster's HCO Calculator results include the following information required for ordering:

- Standard HCO size eg. **HCO-300-150**
- Loc _____ [mm] Rounded up to the nearest 5mm e.g. 25mm
- D/S box gutter depth _____ [mm] Rounded up to the nearest 5mm e.g. 165mm
- Depth to crease fold _____ [mm]



NOTE - Sump Deflector Cover
Refer to Appendix C for installation details for the Sump Deflector Cover

Dam Buster HCO

Available HCO sizes

HCO-300-150	H= 200
HCO-300-200	" "
HCO-300-250	" "
HCO-400-150	H= 240
HCO-400-200	" "
HCO-400-250	" "
HCO-450-150	H= 240
HCO-450-200	" "
HCO-450-250	" "
HCO-500-150	H= 240
HCO-500-200	" "
HCO-500-250	" "
HCO-600-150	H= 240
HCO-600-200	" "
HCO-600-250	" "

Dam Buster DtS Box Gutter Overflow Devices

5. Dam Buster Sump / Side Overflow ('SSO')

5.1 Description

1. The Dam Buster SSO comprises two components:
   - A sump with one or two box gutter receivers
   - A rectangular overflow duct
2. The height of the device above the sole of the box gutter receivers is 200mm for the 300mm wide SSO series, and 240mm for all other (larger) SSO series. The device is cut down on site as required by the roof plumber to match the downstream depth of the box gutters.
3. Note that if the downstream box gutter depth exceeds 200mm for the 300mm wide HCO series, or 240mm for all other HCO series, a flashing can be installed between the top of the sump and the underside of the roof sheeting.
4. The overflow ducts are supplied as 450mm long and cut down to the required length or else extended, as required by the plumber on site.

5.2 Available Dam Buster SSO & SOD Sizes

Available Standard Sizes

Label		300mm wide series	400mm wide series	600mm wide series
SS0-www-ddd-1	One box gutter receiver	SSO-300-50-1		
		SSO-300-100-1	SS0-400-100-1	
		SSO-300-150-1	SSO-400-150-1	SSO-600-150-1
		SSO-300-200-1	SSO-400-200-1	SSO-600-200-1
			SSO-400-250-1	SSO-600-250-1
SS0-www-ddd-2	Two box gutter receivers	SSO-300-50-2		
		SSO-300-100-2	SS0-400-100-2	
		SSO-300-150-2	SSO-400-150-2	SSO-600-150-2
		SSO-300-200-2	SSO-400-200-2	SSO-600-200-2
			SSO-400-250-2	SSO-600-250-2
Side Overflow Duct (SOD)				
	Total flow rate (L/s)	**200mm wide series**	**250mm wide series**	**300mm wide series**
SOD-www-ddd	3.0			
	4.0	SOD-200-75		
	5.0			
	6.0			
	7.0		SOD-250-90	
	8.0			
	9.0			
	10.0			
	11.0			
	12.0			
	13.0			
	14.0			
	15.0			
	16.0			SOD-300-125

Dam Buster DtS Box Gutter Overflow Devices

5. Dam Buster Sump / Side Overflow ('SSO') cont.

5.3 Design

As noted in section 2.2, the Dam Buster Calculator MUST be used for the SSO because this will result in the most efficient design using Dam Buster's products.

Dam Buster has limited the SOD selection to the following sizes:

- Total flowrates up to 4.0 L/s 200x75
- Total flowrates up above 4.0 L/s and up to 7.0 L/s 250x90
- Total flowrates above 7.0 L/s and up to 16.0 L/s 300x125

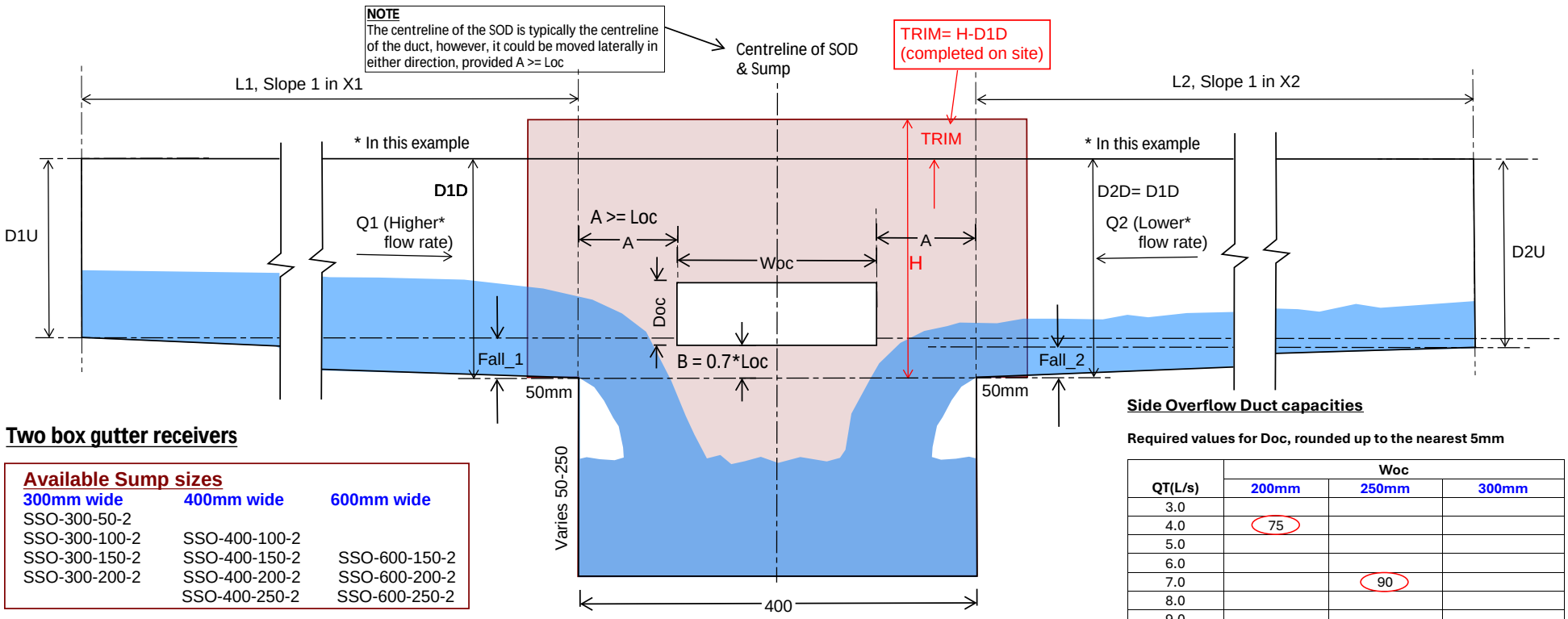
The design upstream depth is based on the depth required by AS/NZS 3500.3. not the actual duct depth. For example, for a total flowrate of 4.5 L/s, and a duct width of 250mm, the required depth of the overflow duct is 70mm. The selected duct size of 250 x 90mm will be 20mm deeper than required, however, if the fall is at least 20mm, no increase is required in the box gutter depth i.e. the overflow duct is larger than required, but the box gutter depth is not affected. Dam Buster's software ensures that there is always at least 30mm above the top of the overflow duct to the top of the box gutter(s) and sump. It would be very unusual for an increase in the box gutter depth to be required.

It is for the above reasons, that Dam Buster's SSO calculator MUST always be used to design Dam Buster's SSO.

5.4 Ordering

Dam Buster's SSO Calculator results include the following information required for ordering:

- Standard sump size e.g. **SSO-300-150-1 Sump**
- Standard duct size e.g. **SOD-250-90 Overflow duct**



Two box gutter receivers

Available Sump sizes

300mm wide	400mm wide	600mm wide
SSO-300-50-2		
SSO-300-100-2	SSO-400-100-2	
SSO-300-150-2	SSO-400-150-2	SSO-600-150-2
SSO-300-200-2	SSO-400-200-2	SSO-600-200-2
	SSO-400-250-2	SSO-600-250-2

One box gutter receiver

Available Sump sizes

300mm wide	400mm wide	600mm wide
SSO-300-50-1		
SSO-300-100-1	SSO-400-100-1	
SSO-300-150-1	SSO-400-150-1	SSO-600-150-1
SSO-300-200-1	SSO-400-200-1	SSO-600-200-1
	SSO-400-250-1	SSO-600-250-1

Dam Buster SSO

Typical SSO (Flow from both sides)

Typical SSO (Flow one side similar UNO*)

* One box gutter receiver only

Values for H

300 Series	H= 200
400 Series	H= 240
600 Series	H= 240

OVERFLOW DUCT LENGTHS

Overflow duct lengths are all supplied as 450mm long.

NOTE

Overflow ducts are installed horizontally. For ducts > 450mm long, the code requires them to be installed at a slope of 1 in 10.

Side Overflow Duct capacities

Required values for Doc, rounded up to the nearest 5mm

QT(L/s)	Woc 200mm	Woc 250mm	Woc 300mm
3.0			
4.0	75		
5.0			
6.0			
7.0		90	
8.0			
9.0			
10.0			
11.0			
12.0			
13.0			
14.0			
15.0			
16.0			125

Available SOD sizes

Available Side Overflow Duct sizes

SOD-200-75

SOD-250-90

SOD-300-125

6. Risk Management & Maintenance of Box Gutter Systems

6.1 *Failure of box gutter installations*

Box gutter systems can and do fail - far more often than they should - and have consequently developed a 'bad reputation'. As a result, Architects and Building Designers often fear box gutters, but this fear is unfounded for a well-designed, constructed and installed box gutter system, incorporating adequate and compliant overflow devices.

Failure predominately occurs due to one or more of the following factors:

- Inadequate / non-existent design and documentation, particularly concerning overflow provision and box gutter depths.
- Manufacturing failing to follow design.
- Non-compliant / poor construction and installation
- Inadequate maintenance of box gutters
- The use of non-conforming roof drainage products

6.2 *Current quality of design and documentation for roof drainage in Australia*

The level of design and documentation of box gutter systems in Australia is currently generally very poor. There are multiple reasons for this, including the following:

- Incorrect and / or insufficient design information on Architectural or Building Design plans
- A lack of understanding, including by Building Certifiers, of the basic principles of roof drainage design
- Non-compliant / poor construction and installation
- AS/NZS 3500.3 is not an easy code to design to, and lacks flexibility in design, providing only three types of overflow devices
- Building Surveyors / Certifiers often do not require/request certification for roof drainage designs, particularly for residential and multi-unit residential type buildings. This situation is however changing gradually, as Building Surveyors / Certifiers recognize the importance of detailed roof drainage design at Building Permit Stage for contemporary-style buildings. Ignoring, or not paying adequate attention to, this very important aspect of the building design also creates an area of potential liability and litigation for them as well as other key parties in the chain of supply.
- Significant numbers of non-conforming roof drainage products including sumps and rainheads present in the market, but which have never met the mandatory requirements of AS/NZS3500.3 and the NCC.

Dam Buster DtS Box Gutter Overflow Devices

6. Risk Management & Maintenance (cont.)

6.3 *The Dam Buster Solution to Roof Drainage problems*

Dam Buster seeks to remedy many of the above problems by:

- Providing fully conforming, pre-engineered box gutter overflow devices as follows:
  - All three DtS devices to 3500.3
  - Dam Buster's (original) innovative devices, which allow much greater design flexibility, these being
    - Dam Buster Side Outlet and Rainhead (or Sump) combination,
    - The Dam Buster Sump, Continuous Sump and Back-to-Back Sump
    - Dam Buster's 'Upstream Devices', these being:
      - Dam Buster Elbow
      - Dam Buster Junctions (T Junction and Corner Junction)
- Providing a simple design / selection process, based on the calculated design flow rate only
- Importantly Dam Buster's original rainhead, and Dam Buster's Open Rainhead, incorporate a novel box gutter receiver, allowing a compliant seal (as required by 3500.3) to be readily achieved between the box gutter and the rainhead. This is important because this junction is a very common point of water ingress into a building.

6.4 *Design considerations to mitigate against the risk of failure*

The following issues should be considered by designers of box gutter systems in order to minimize the risk of failure:

- The DtS devices have different risks of failure. This is not purely related to hydraulics but relates to the fact that stormwater is often not clean but rather may contain often unpredictable types and levels of debris.
- The relative safety of DtS devices (if accounting for the presence of debris) is as follows:

SAFEST

Open Rainhead ('OR') note: The parapet wall can provide a catchpoint for debris.

Sump and Side Overflow ('SSO')

Sump / High-Capacity Overflow device ('HCO')

LEAST SAFE

- The HCO was most likely designed to be used internally where it was too far from an external wall to discharge the box gutter using either of the other overflow devices. However, the HCO has been increasingly used in smaller buildings for aesthetic reasons (i.e. to avoid rainheads and side overflow ducts through external walls).

6. Risk Management & Maintenance (cont.)

6.4 *Design considerations to mitigate against the risk of failure* (cont.)

- Where an HCO is required internally, it may be possible to install an additional side overflow duct, which transitions to suspended pipe and discharges through an external wall. Refer to diagram 1 below. This may be prudent in some situations, such as where significant leaf litter can be expected and / or regular inspection and maintenance will not necessarily be carried out. This is an example of risk mitigation but involves additional cost. It must be recognised that the Australian Standards represent a baseline minimum and therefore can be augmented or oversized if this is prudent to do so. For this reason, Dam Buster recommends all flow rates be increased by a minimum of 10%. This be ready applied using Dam Buster's software, and has little, if any, cost consequences in most applications.

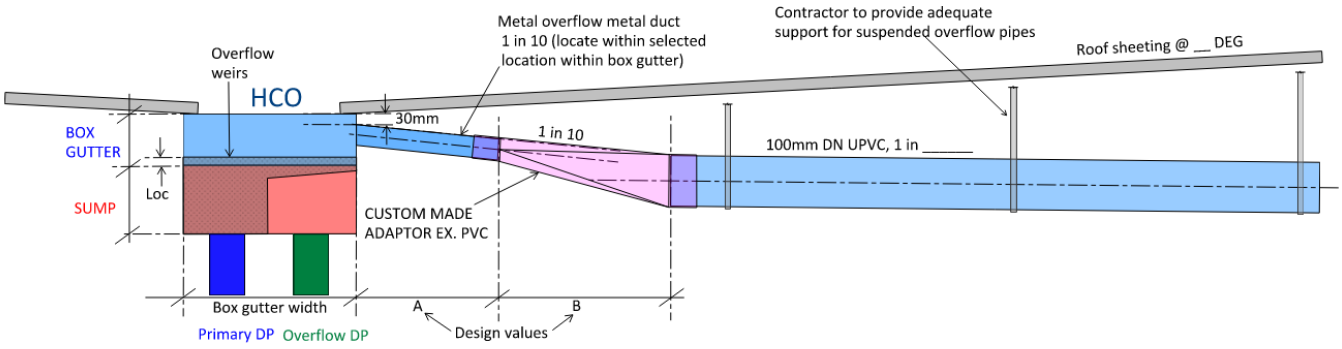


Diagram 1 - Potential additional Side Overflow Duct to HCO transitioning to a suspended overflow pipe

- Importantly Dam Buster's original rainhead, and Dam Buster's Open Rainhead incorporate a novel box gutter receiver, allowing a good seal to be readily achieved between the box gutter and the rainhead. This is important because this junction is a very common point of water ingress into a building.

6.5 *Cleaning / maintenance of box gutter systems*

AS/NZS 3500.3-2021, section M.5, states:

> *'Sizing of stormwater drainage installations assumes the responsible owner or manager arranges regular inspection and cleaning to remove any obstructions that could reduce the installation's hydraulic capacity or design lifetime, or both.*
>
> *Obstructions that could cause partial or complete reduction in the hydraulic capacity are windborne plastics, drink cans, builder's refuse, balls, bird nests, items deposited by birds, dead birds, leaves, moss, mortar, silt or similar obstructions.*
>
> *Guards on gutters and gutter outlets and screens on outlets from on-site stormwater detention (OSD) facilities are installed to prevent reduction in hydraulic capacity due to obstructions. Installation of such guards and screens does not eliminate the need for regular inspection and cleaning. Guards used with rainwater goods might collect debris during high intensity storms, in spite of regular inspection and cleaning, and for this reason it might be better not to install such guards, particularly on box gutter sumps.'*

6. Risk Management & Maintenance (cont.)

6.5 *Cleaning / maintenance of box gutter systems (cont.)*

Whilst ideally all owners would carry out regular inspection and maintenance, this often does not happen, and consequently it is incumbent on the roof drainage designer to minimize the risk of failure in the first instance through good, compliant design.

6.6 *Safe Access for Maintenance & Cleaning*

Good design, where possible, should include the provision of safe access to allow regular inspection and maintenance to be carried out to the roof stormwater drainage system. This is the responsibility of the architect / building designer.

6.7 *Summary – Risk Management*

In summary, there are various matters to consider when designing roof drainage, and also various strategies to minimize the risk of failure. A well-considered design in accordance with the relevant standards and also using the Dam Buster Roof Drainage System, carried out during the design process (i.e. as part of the Building Permit documentation) will, if correctly installed, ensure compliance and also minimize the risk of any potential failure of a box gutter system.

6.8 *Sump Deflector Covers*

Note 4 of Clause 3.7.7.2 *Operation* (of Overflow devices), AS/NZS 3500.3-2025 states:

'If water flowing directly into the overflow is a problem, a deflector or cap may be installed to divert the water.'

Dam Buster's HCO includes a removable Sump Deflector Cover, which acts to prevent 'nuisance flows' from occurring. This may be important where the overflow pipe discharges in a prominent area (e.g., near an entry) and / or where the overflowing water potentially creates a slip hazard. The Sump Deflector Cover will also help to prevent wind-blown debris from entering the overflow compartment from above but may inadvertently also provide a shelter for birds or small animals such as possums seeking nesting areas and therefore regular maintenance is essential. The Sump Deflector Cover is made easily removable to facilitate ease of maintenance. The Sump Deflector Cover can be omitted but this may require the overflow being piped to a different location that is still visible but does not create nuisance or impact building amenity.

Appendix A

Dam Buster Box Gutter Design Charts

(for Open Rainhead (OR) only)

These Charts MUST NOT be used for the DtS HCO or SSO Devices.

For designing box gutters servicing the DtS HCO and SSO Devices, the customer must use Dam Buster's Calculators.

Dam Buster DtS Box Gutter Overflow Devices

Design chart for box gutters discharging to a Dam Buster Open Rainhead ('OR') only

Minimum UPSTREAM box gutter depth (mm) for 1 in 200* slope

* 1 in 100 equates to 5mm per m increasing depth over the length of the box gutter

Design flow rate L/s	Box gutter width (mm)								
	200	**250**	**300**	**350**	**400**	**450**	**500**	**550**	**600**
3.0	107	101	96	93	90	88	86	84	83
3.5	113	105	100	96	93	91	89	87	85
4.0	118	110	104	100	96	94	91	89	88
4.5	122	114	107	103	99	96	94	92	90
5.0	127	118	111	106	102	99	96	94	92
5.5	131	121	114	109	105	101	99	96	94
6.0	135	125	118	112	107	104	101	98	96
6.5	140	129	121	115	110	106	103	101	98
7.0	144	132	124	118	113	109	105	103	100
7.5	148	135	127	120	115	111	107	105	102
8.0	151	139	130	123	118	113	110	107	104
8.5	155	142	133	125	120	115	112	108	106
9.0	159	145	135	128	122	118	114	110	107
9.5	162	148	138	131	125	120	116	112	109
10.0	166	151	141	133	127	122	118	114	111
10.5	170	154	144	135	129	124	119	116	113
11.0	173	157	146	138	131	126	121	118	114
11.5	176	160	149	140	133	128	123	119	116
12.0	180	163	151	142	135	130	125	121	118
12.5	183	166	154	145	137	132	127	123	119
13.0	186	169	156	147	140	134	129	124	121
13.5	190	172	159	149	142	135	130	126	122
14.0	193	174	161	151	144	137	132	128	124
14.5	196	177	164	154	146	139	134	129	125
15.0	199	180	166	156	148	141	135	131	127
15.5	202	182	168	158	149	143	137	132	128
16.0	205	185	171	160	151	144	139	134	130

Dam Buster DtS Box Gutter Overflow Devices

Design chart for box gutters discharging to a Dam Buster Open Rainhead ('OR') only

Minimum UPSTREAM box gutter depth (mm) for 1 in 150* slope

* 1 in 100 equates to 7mm approx. per m increasing depth over the length of the box gutter

Design flow rate L/s	Box gutter width (mm)								
	200	**250**	**300**	**350**	**400**	**450**	**500**	**550**	**600**
3.0	104	98	94	90	88	86	84	82	81
3.5	109	102	97	94	91	88	87	85	83
4.0	113	106	101	97	94	91	89	87	86
4.5	118	110	104	100	96	94	91	89	88
5.0	122	113	107	103	99	96	94	92	90
5.5	126	117	110	105	102	98	96	94	92
6.0	130	120	113	108	104	101	98	96	94
6.5	134	124	116	111	106	103	100	98	95
7.0	138	127	119	113	109	105	102	99	97
7.5	141	130	122	116	111	107	104	101	99
8.0	145	133	125	118	113	109	106	103	101
8.5	148	136	127	121	116	111	108	105	102
9.0	152	139	130	123	118	113	110	107	104
9.5	155	142	133	125	120	115	112	108	106
10.0	158	145	135	128	122	117	113	110	107
10.5	162	148	138	130	124	119	115	112	109
11.0	165	150	140	132	126	121	117	113	110
11.5	168	153	142	134	128	123	119	115	112
12.0	171	156	145	136	130	125	120	117	113
12.5	174	158	147	139	132	126	122	118	115
13.0	177	161	149	141	134	128	124	120	116
13.5	180	164	152	143	136	130	125	121	118
14.0	183	166	154	145	138	132	127	123	119
14.5	186	169	156	147	139	133	128	124	121
15.0	189	171	158	149	141	135	130	126	122
15.5	192	174	161	151	143	137	132	127	123
16.0	195	176	163	153	145	138	133	129	125

Dam Buster DtS Box Gutter Overflow Devices

Design chart for box gutters discharging to a Dam Buster Open Rainhead ('OR') only

Minimum UPSTREAM box gutter depth (mm) for 1 in 100* slope

* 1 in 100 equates to 10mm per m increasing depth over the length of the box gutter

Design flow rate L/s	Box gutter width (mm)								
	200	**250**	**300**	**350**	**400**	**450**	**500**	**550**	**600**
3.0	102	96	92	89	86	84	83	81	80
3.5	106	100	95	92	89	87	85	83	82
4.0	110	103	98	95	92	89	87	86	84
4.5	115	107	102	98	94	92	90	88	86
5.0	119	110	105	100	97	94	92	90	88
5.5	122	114	108	103	99	96	94	92	90
6.0	126	117	110	106	102	98	96	94	92
6.5	130	120	113	108	104	101	98	96	94
7.0	133	123	116	110	106	103	100	97	95
7.5	137	126	119	113	108	105	102	99	97
8.0	140	129	121	115	110	107	103	101	98
8.5	143	132	124	117	113	109	105	102	100
9.0	147	135	126	120	115	110	107	104	102
9.5	150	137	129	122	117	112	109	106	103
10.0	153	140	131	124	119	114	110	107	105
10.5	156	143	133	126	120	116	112	109	106
11.0	159	145	136	128	122	118	114	110	108
11.5	162	148	138	130	124	119	115	112	109
12.0	165	150	140	132	126	121	117	113	110
12.5	168	153	142	134	128	123	119	115	112
13.0	171	155	144	136	130	124	120	116	113
13.5	174	158	147	138	131	126	122	118	115
14.0	176	160	149	140	133	128	123	119	116
14.5	179	163	151	142	135	129	125	121	117
15.0	182	165	153	144	137	131	126	122	119
15.5	184	167	155	146	138	132	128	123	120
16.0	187	170	157	148	140	134	129	125	121

Dam Buster DtS Box Gutter Overflow Devices

Design chart for box gutters discharging to a Dam Buster Open Rainhead ('OR') only

Minimum UPSTREAM box gutter depth (mm) for 1 in 40* slope

* 1 in 100 equates to 25mm per m increasing depth over the length of the box gutter

Design flow rate L/s	Box gutter width (mm)								
	200	**250**	**300**	**350**	**400**	**450**	**500**	**550**	**600**
3.0	93	88	85	83	81	79	78	77	76
3.5	96	91	88	85	83	81	80	78	77
4.0	100	94	90	87	85	83	82	80	79
4.5	103	97	93	90	87	85	83	82	81
5.0	106	100	95	92	89	87	85	83	82
5.5	109	102	97	94	91	89	87	85	84
6.0	112	105	100	96	93	90	88	86	85
6.5	115	107	102	98	95	92	90	88	86
7.0	118	110	104	100	96	94	91	89	88
7.5	120	112	106	102	98	95	93	91	89
8.0	123	114	108	103	100	97	94	92	90
8.5	126	117	110	105	101	98	96	93	92
9.0	128	119	112	107	103	100	97	95	93
9.5	131	121	114	109	105	101	98	96	94
10.0	133	123	116	110	106	103	100	97	95
10.5	136	125	118	112	108	104	101	98	96
11.0	138	127	119	114	109	105	102	100	97
11.5	140	129	121	115	111	107	104	101	99
12.0	143	131	123	117	112	108	105	102	100
12.5	145	133	125	118	113	109	106	103	101
13.0	147	135	126	120	115	111	107	104	102
13.5	149	137	128	122	116	112	108	105	103
14.0	152	139	130	123	118	113	110	107	104
14.5	154	141	131	125	119	115	111	108	105
15.0	156	143	133	126	120	116	112	109	106
15.5	158	144	135	127	122	117	113	110	107
16.0	160	146	136	129	123	118	114	111	108

Appendix B

Aerial Overflow Pipes

Dam Buster DtS Box Gutter Overflow Devices

Design chart for aerial downpipes

Slope	Pipe diameter			
	90mm	100mm	150mm	225mm
1 in 200	4.14	5.49	16.2	47.5
1 in 190	4.26	5.65	16.6	48.9
1 in 180	4.39	5.82	17.1	50.3
1 in 170	4.53	6.00	17.7	51.9
1 in 160	4.68	6.21	18.3	53.7
1 in 150	4.85	6.43	18.9	55.6
1 in 140	5.04	6.68	19.6	57.7
1 in 130	5.25	6.96	20.5	60.1
1 in 120	5.49	7.27	21.4	62.7
1 in 110	5.76	7.63	22.4	65.7
1 in 100	6.07	8.04	23.6	69.2
1 in 90	6.43	8.52	25.0	73.3
1 in 80	6.86	9.09	26.7	78.0
1 in 70	7.38	9.77	28.7	83.9
1 in 60	8.03	10.6	31.2	91.1
1 in 50	8.87	11.7	34.4	100.4

Maximum flow rates* (L/s)

* Based on a standard Colebrook-White calculator

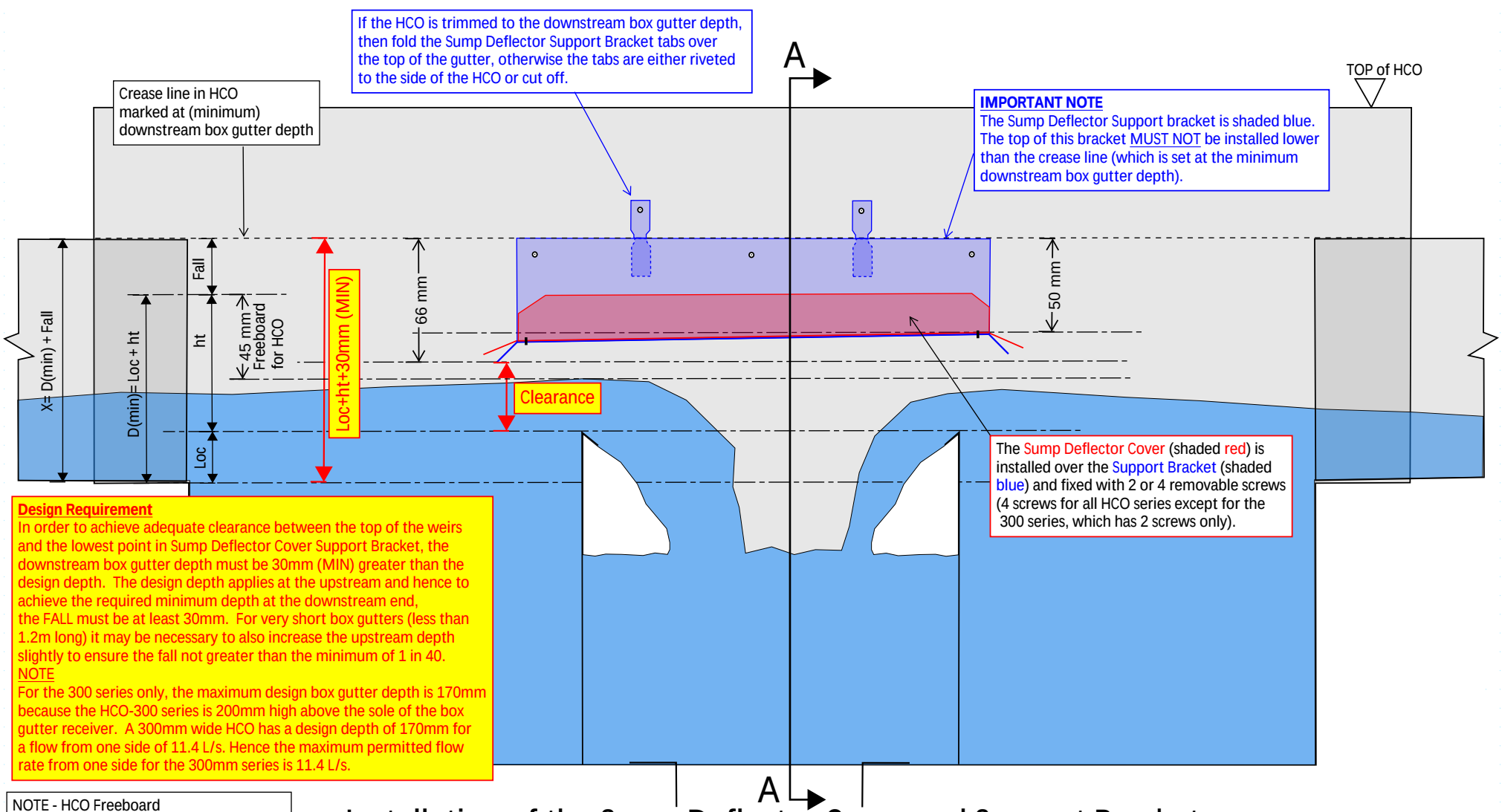
Note

The table assumes there are no additional bends in the aerial downpipe other than the bend below the sump. Where there are additional bends, which will result in energy losses, specific advice should be obtained from a hydraulic engineer.

Appendix C

Installation details for the

HCO Sump Deflector Cover

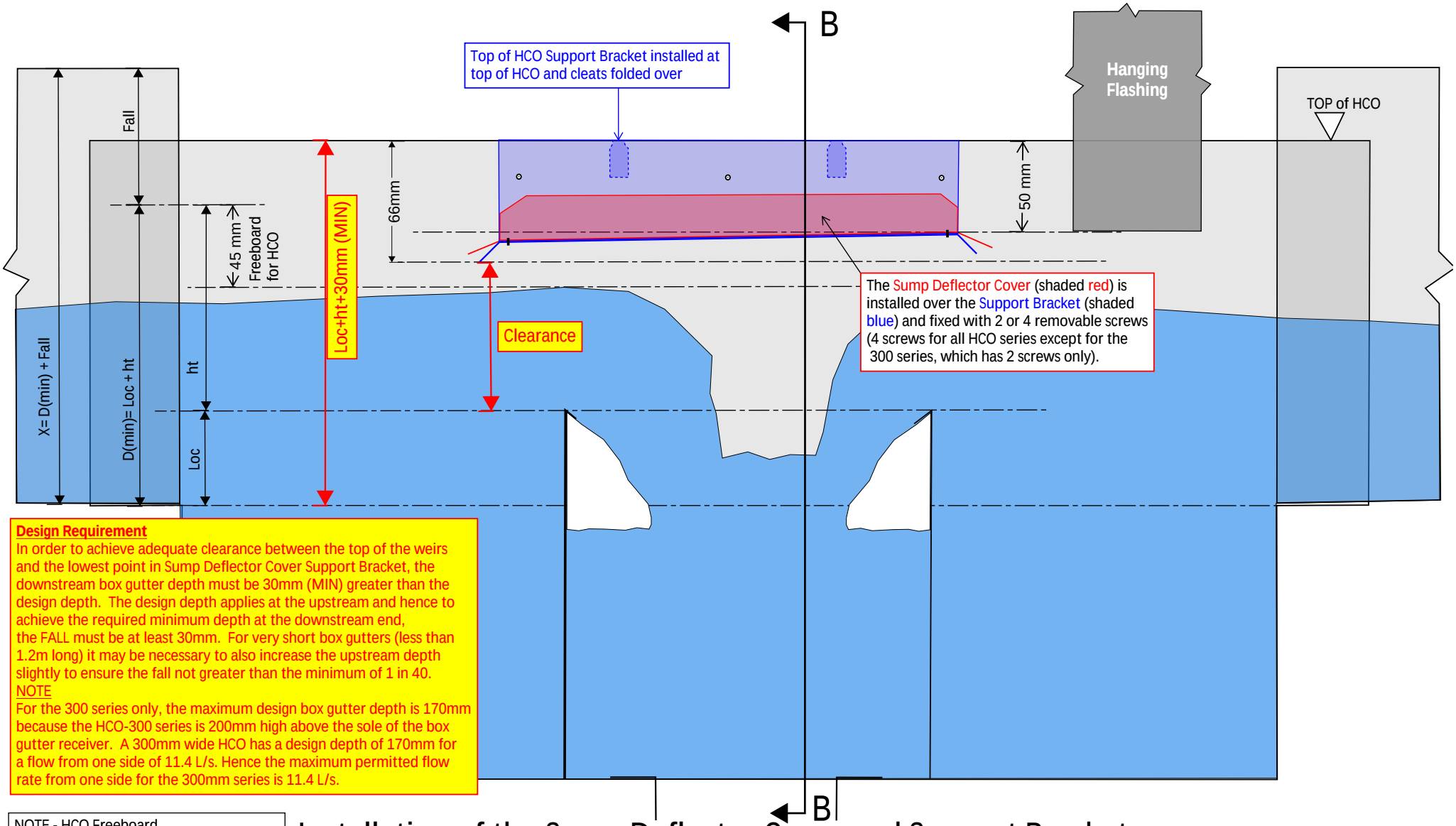


Design Requirement
In order to achieve adequate clearance between the top of the weirs and the lowest point in Sump Deflector Cover Support Bracket, the downstream box gutter depth must be 30mm (MIN) greater than the design depth. The design depth applies at the upstream and hence to achieve the required minimum depth at the downstream end, the FALL must be at least 30mm. For very short box gutters (less than 1.2m long) it may be necessary to also increase the upstream depth slightly to ensure the fall not greater than the minimum of 1 in 40.
NOTE
For the 300 series only, the maximum design box gutter depth is 170mm because the HCO-300 series is 200mm high above the sole of the box gutter receiver. A 300mm wide HCO has a design depth of 170mm for a flow from one side of 11.4 L/s. Hence the maximum permitted flow rate from one side for the 300mm series is 11.4 L/s.

NOTE - HCO Freeboard
The 45mm freeboard is taken from a 1999 paper by Ralph Jones & Eugene Kloti

Installation of the Sump Deflector Cover and Support Bracket

Downstream box gutter depth **less than, or equal to**, the height of the HCO

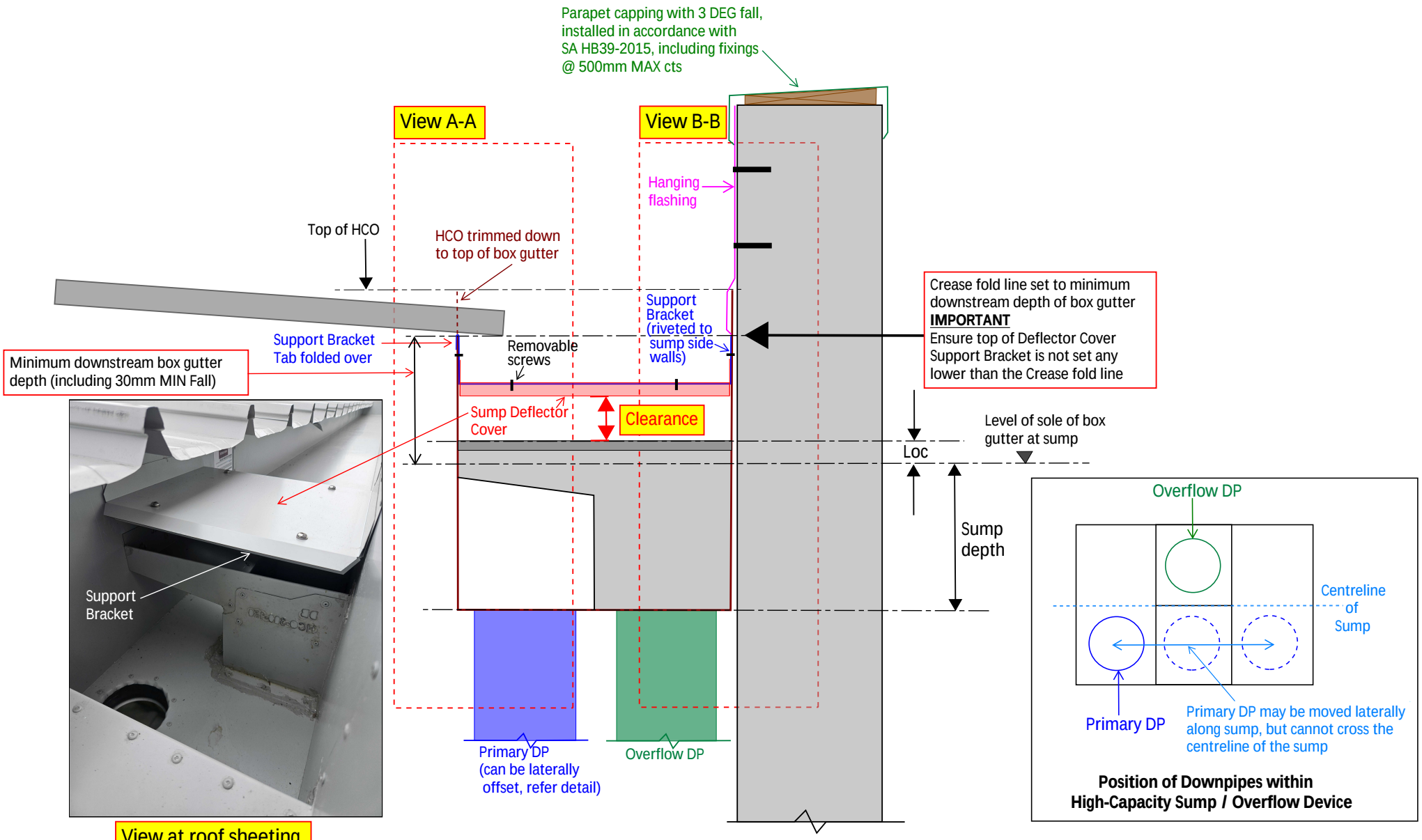


Design Requirement
In order to achieve adequate clearance between the top of the weirs and the lowest point in Sump Deflector Cover Support Bracket, the downstream box gutter depth must be 30mm (MIN) greater than the design depth. The design depth applies at the upstream and hence to achieve the required minimum depth at the downstream end, the FALL must be at least 30mm. For very short box gutters (less than 1.2m long) it may be necessary to also increase the upstream depth slightly to ensure the fall not greater than the minimum of 1 in 40.
NOTE
For the 300 series only, the maximum design box gutter depth is 170mm because the HCO-300 series is 200mm high above the sole of the box gutter receiver. A 300mm wide HCO has a design depth of 170mm for a flow from one side of 11.4 L/s. Hence the maximum permitted flow rate from one side for the 300mm series is 11.4 L/s.

NOTE - HCO Freeboard
The 45mm freeboard is taken from a 1999 paper by Ralph Jones & Eugene Kloti

Installation of the Sump Deflector Cover and Support Bracket

Downstream box gutter depth **greater than** the height of the HCO or HCO not cut down at parapet wall



Typical Section thru HCO showing Sump Deflector & Support Bracket