

DAM BUSTER®

Achieve Compliance with **Dam Buster Products**

NOTE: All Dam Buster® products are protected by various Australian and International Patents.



This document is to be read in conjunction Dam Buster publications titled 'Product Technical Statement' and 'Installation Manual'. Together, these documents form Evidence of Suitability for both the BCA & PCA in accordance with governing provisions A5.2 & A5.3.

EVIDENCE OF SUITABILITY

Version 4.2 (9 June 2023)



CERTIFIED PRODUCT
(DAMBUSTER RAINHEAD)

For testing of the Overflow Performance of Dam Buster rectangular rainheads.



PRODUCT DESIGN
HARDWARE AND BUILDING
DAM BUSTER
RAINHEAD

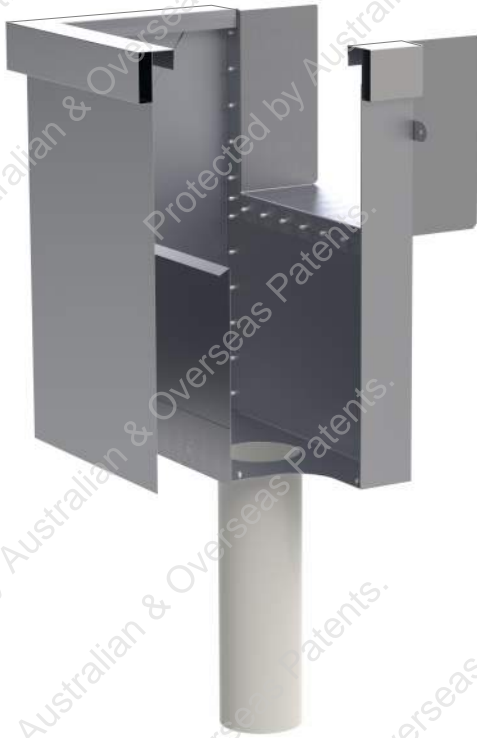
"The Architectural Choice"

www.dambuster.com.au

Dam Buster Roof Drainage System - Product Range

Overflow devices (1 of 2)

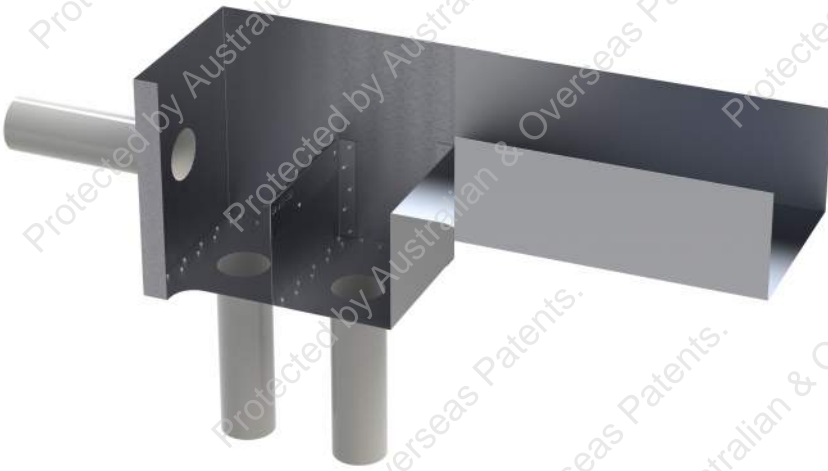
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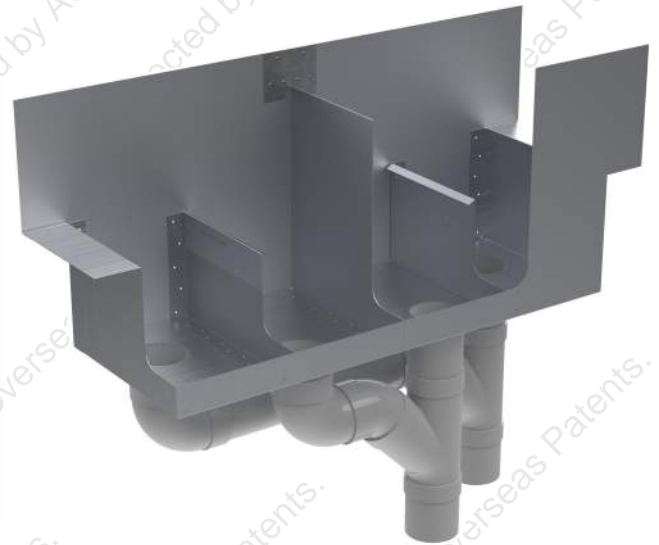
Dam Buster Rainhead



Dam Buster Curved Fronted Rainhead



Dam Buster Sump



Dam Buster Back-to-Back Sump

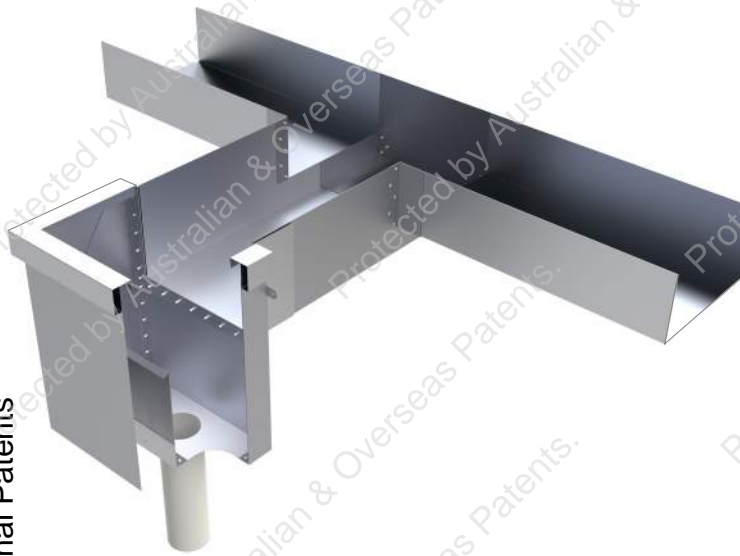


Dam Buster Continuous Sump

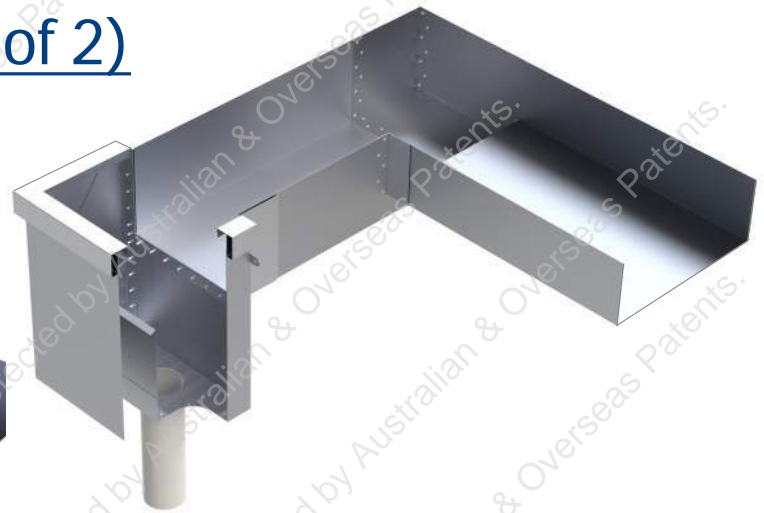
Dam Buster Roof Drainage System - Product Range (cont)

Overflow devices (2 of 2)

Protected by various Australian and International Patents



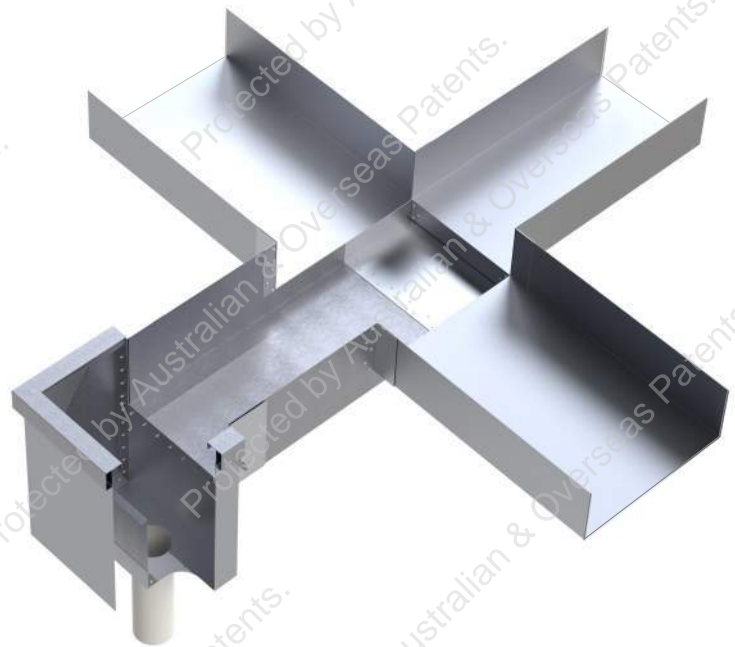
Dam Buster T Side Outlet & Rainhead



Dam Buster END Side Outlet & Rainhead (LH & RH forms available)



Dam Buster CORNER Side Outlet & Rainhead (LH & RH forms available)



Dam Buster CRUCIFORM Side Outlet & Rainhead



Dam Buster END Side Outlet & Sump (LH & RH forms available)

NOTE

The following Side Outlet & Sump combinations are also possible

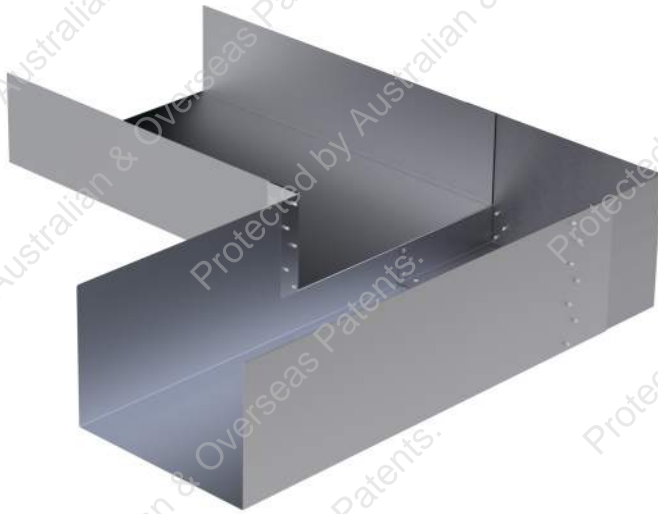
Dam Buster T Side Outlet & Sump

Dam Buster Corner Side Outlet & Sump

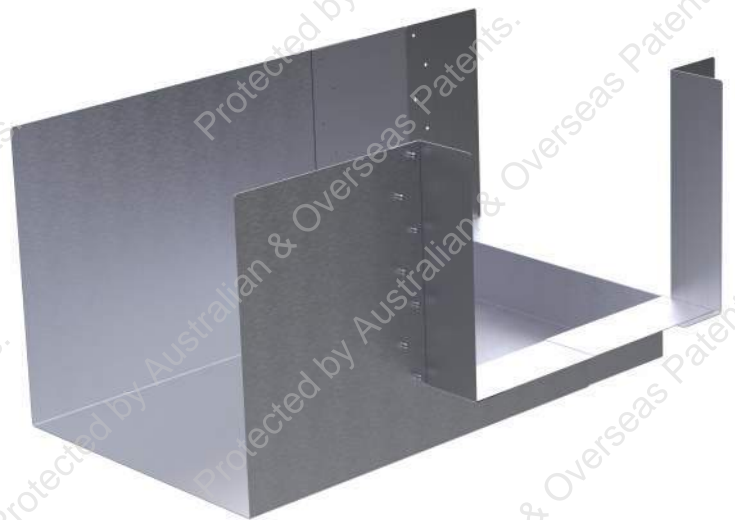
Dam Buster Cruciform Side Outlet & Sump

Dam Buster Roof Drainage System - Product Range (cont)

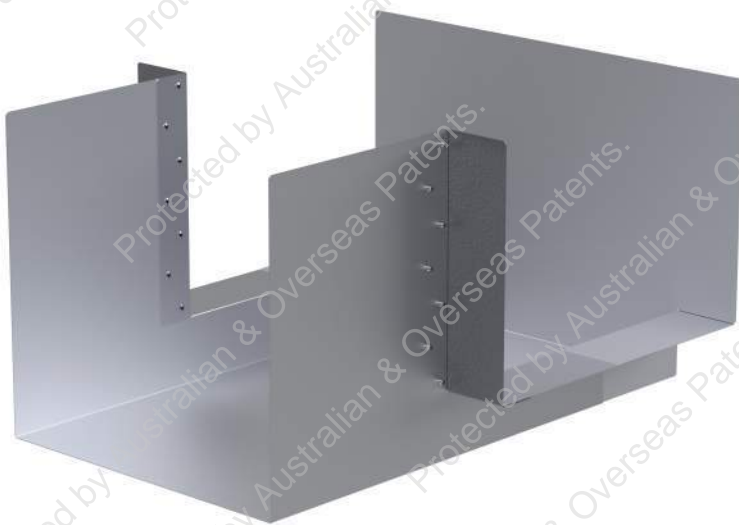
Upstream devices



Dam Buster Elbow



Dam Buster Corner Junction



Dam Buster T Junction



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NOTE

Where this document refers to any code, guide or manual, this reference should be interpreted as being for the current legal version of the code, guide or manual for the relevant state or territory, unless noted otherwise.



1.0 DAM BUSTER PRODUCTS

The components which form the Dam Buster Roof Drainage System can be used in both domestic and commercial roof plumbing applications.

Dam Buster products are comprised of Zinalume, Colorbond or other approved metal materials suitable for use in domestic and/or commercial roof drainage systems.

Models:

- Dam Buster **Rainhead**
- Overflow device comprising a **Dam Buster Side Outlet** (4 available types) and a **Dam Buster Rainhead** or a **Dam Buster Sump**
- Dam Buster **Sump, Continuous Sump** and '**Back-to-Back**' Sump ('free flow' sumps)
- Dam Buster **Elbow** & Dam Buster **Junctions** (2 available types)

2.0 UNDERSTANDING COMPLIANCE

Roof drainage is slightly treated differently in some states of Australia. In all states and territories, roof drainage falls under the relevant sections of the NCC volumes 1 and 2 (i.e. the Building Code of Australia or BCA). However, in Victoria and Tasmania (only) there are state additions for roof drainage within the NCC Volume 3 (i.e. the Plumbing Code of Australia or PCA), enabling roof drainage to also be carried out as regulated plumbing work under the relevant state Plumbing Regulations. There are different pathways through the NCC, but in all cases it is necessary to comply with both the **Governing Requirements** and the relevant **Performance Requirements** (which differ, but are similar, between the BCA and the PCA). Note the Part A Governing Provisions of the NCC is the same for each volume.

Part A2 of the NCC, titled '**Compliance with the NCC**' explains the possible methods of demonstrating compliance with the NCC. It explains the various compliance pathways within the NCC, and the appropriate steps that must be taken for each of these pathways. Part A2 includes the following chapters:

- A2G1 Compliance
- A2G2 Performance Solutions
- **A2G3 Deemed-to-Satisfy Solution**
- **A2G4 A combination of solutions**

Dam Buster adopts both parts **A2G3** and **A2G4**, as explained below.



3.0 COMPLIANCE WITH THE NCC GOVERNING PROVISIONS

3.1 Part A2G3(1) - DtS Solutions by compliance with AS/NZS 3500.3

Box gutters discharging to all Dam Buster devices operate under 'free flow' in both the normal flow and overflow conditions. This means that all box gutters discharging to Dam Buster box gutter overflow devices are designed in accordance with Appendix H, Figure H.1 of AS/NZS 3500.3. The design of the upstream box gutter discharging to a Dam Buster Elbow is slightly different; it is designed for a flow rate equivalent to the total catchment area of the roof sections discharging to both the upstream and downstream box gutters, however it is still designed in accordance with Figure H.1. Note, it is not necessary to design the downstream box gutter from the Dam Buster Elbow, as it will automatically comply with Figure H.1 due to its increased depth as a result of the vertical drop within the Elbow. The Dam Buster Junctions are designed slightly differently, refer to the Product Technical Statement.

Note that all box gutters discharging to Dam Buster devices must be designed for a minimum of 3L/s and a maximum flow rate of 16L/s. If the calculated flow rate is less than 3 L/s, a design flow rate of 3L/s should be adopted. Where more than one box gutter discharges into a Dam Buster box gutter overflow device, the overflow device is designed for the total of the actual design flows, but again not less than 3L/s.

The fact that all box gutters discharging to Dam Buster devices operate under free flow in both the normal flow and overflow conditions allows them to be designed 'independently' of the device itself.

In summary, all box gutters (which have been correctly designed for 'free flow' in accordance with Figure H.1, Appendix H, of AS/NZS 3500.3) utilised in conjunction with correctly sized and installed Dam Buster products are Deemed-to-Satisfy Solutions (unless otherwise covered by a separate box gutter Performance Solution, if necessary).



3.2 **Part A2G3(2) - DTS Solutions by Expert Judgement**

The Dam Buster Rainhead, when used in a conventional manner (i.e. at the downstream end of a straight box gutter), is **Deemed-To-Satisfy by Expert Judgement** in accordance with governing provision **A2G3 Deemed-to-Satisfy Solution**, part **(2) (b), Expert Judgement**. Refer to section 4 for information regarding Dam Buster's hydraulics expert. However, if this approach is not accepted by the state or territory Regulator, or the Building Surveyor / Certifier, then the Dam Buster Rainhead may be certified under a Performance Solution, refer section 3.3.

In the normal flow condition, the Dam Buster Rainhead is designed in accordance with Appendix H, Figures H.2 and H.3, of AS/NZS 3500.3.

In the overflow condition, the hydraulic capacity of the Dam Buster rainhead was tested by the AHSCA Research Foundation, refer to section 5 below.

In relation to the physical construction of the rainhead, Figure H.2 of Appendix H of AS/NZS 3500.5, note 4, states "*The rainhead to be fully sealed to the box gutter and the front of the rainhead left open above the overflow weir*". There is nothing above the internal weir in the Dam Buster Rainhead, and therefore its construction does not contravene Figure H.2. The Dam Buster's unique box gutter receiver feature allows a compliant seal to be achieved between the box gutter and the rainhead.

The AHSCA Research Foundation Overflow Performance Test Certificates provide Evidence of Suitability under the following sections of the NCC:-

- BCA volumes 1 and 2
A5G3(1)(e) '*A certificate from a professional engineer or appropriately qualified person that - ...*'
- PCA
A5G4(6) '*Evidence to support that a design or system meets the relevant PCA Performance Requirements must be in the form of any one or any combination of the following:(a) The design or system complies with a Deemed-To-Satisfy Provision*

In relation to the required overflow capacity, the relevant DTS provision is Clause 3.7.5 *Hydraulic Capacity* of AS/NZS 3500.3, which requires the hydraulic capacity of the overflow device to be at least equal to design flow capacity for the associated gutter. The overflow capacity of Dam Buster's Rainhead exceeds the normal flow capacity in all cases and is in fact greater than 16L/s for each standard size.



3.3 **Part A2G4 – Combination of Solutions**

Dam Buster adopts governing provision part **A2G4 A combination of solutions**, where:

- Box gutters discharging to a Dam Buster device are Deemed-to-Satisfy
- The Dam Buster device itself is a Performance Solution

All Dam Buster devices, as below, may be certified as **Performance Solutions**:

- **Dam Buster Rainhead**
- Box gutter overflow device comprising a **Dam Buster Side Outlet** and a **Dam Buster Rainhead**
- **Dam Buster Sump, Continuous Sump, and Back-to-Back Sump**
- **Dam Buster Elbow & Dam Buster Junctions**

Part A2G2 Performance Solutions requires that the solution demonstrates compliance with the relevant Performance Requirements or is shown to be at least equivalent to the Deemed-To-Satisfy Provisions. There are various possible assessment methods, including the following, and combination of methods may be used:

- Part A2G2 (2) (c) *Expert Judgment*.
- Part A2G2 (2) (d) Comparison with the *Deemed-To-Satisfy Provisions*

Dam Buster adopts a combination of the above methods. Dam Buster has carried out hydraulic testing of all our products in association with Dam Buster's expert, Adjunct Associate Professor Dr Robert Keller of Monash University (refer section 4 for further details).

Dr Keller has witnessed and overseen all of Dam Buster's testing and has prepared Expert Opinion documentation in relation to the usage of Dam Buster's devices. The Expert Opinion documentation includes drawings of Dam Buster's devices, which nominate the maximum allowable flow rate for each device for each permitted device usage. For example, for the Dam Buster Sump, the maximum allowable flow rate is stated for each sump size and downpipe and overflow downpipe combination.

The Expert Opinion documentation includes comparisons of Dam Buster's devices with the DTS provisions within AS/NZS 3500.3 (i.e. for the design of box gutters and overflow devices within this standard). These comparisons indicate that Dam Buster devices are at least as safe as the DTS provisions.



In particular, it is demonstrated that the freeboard is always at least equal to, or greater than, the freeboard required by the standard. Additionally, the overflow capacity of Dam Buster's box gutter overflow devices significantly exceeds the normal flow capacity in all cases.

It is the licensed roof plumber's responsibility to certify all works associated with the installation of the box gutters and Dam Buster devices in accordance with the specific requirements of that State or Territory.

4.0 DAM BUSTER'S EXPERT

Dam Buster's Expert, Adjunct Associate Professor Dr Robert Keller of Monash University. Dr Keller is a highly reputable hydraulic engineer with the qualifications and experience to determine that the Dam Buster roof drainage system devices meet the relevant Performance Requirements of the NCC. Dr Keller has over forty years of experience in Civil Engineering Hydraulics. Currently a consulting engineer, his main areas of expertise are steady and transient flow analyses of pipe network systems, physical and numerical modelling of river works and hydraulic structures, river stability, bank and bed protection, scour studies, and urban storm drainage analyses. He has conducted many technical courses for practising engineers in Australia, New Zealand and South East Asia.



Adjunct Associate Professor
Dr Robert Keller



Dr Keller was previously an Associate Professor at Monash University, retiring in 2008, and is currently an Adjunct Associate Professor at Monash University who continues to consult in his area of expertise. Dr Keller is the author or co-author of over 120 technical papers in addition to numerous consulting reports and has received various honours and awards for his work.

5.0 EVALUATION METHODS

This Evidence of Suitability applies to all sizes of the following components of the Dam Buster Roof Drainage System:

- A. Dam Buster **Rainhead** overflow device
- B. Overflow device comprising a Dam Buster **Side Outlet** (4 available types) and a Dam Buster **Rainhead** or **Dam Buster Sump**
- C. Dam Buster **Sump**, Dam Buster **Continuous Sump** or Dam Buster **Back-to-Back Sump** overflow devices
- D. Dam Buster **Elbow**

Testing of Dam Buster Rainheads by the AHSCA Research Foundation

Independent testing of all Dam Buster rainheads (product A above) was carried out by the AHSCA Research Foundation ('AHSCA-RF') at the stormwater research facility located at the University of the Sunshine Coast, Queensland. This testing was primarily for the overflow capacity of the rectangular rainheads, and all Dam Buster rectangular rainheads achieved overflow rates of at least 16 L/s.

The normal flow capacities of all Dam Buster rainheads have been determined in accordance with AS/NZS 3500.3 ('3500.3'), and the flow capacities have also been checked and independently certified by Dr Keller.

Overflow Performance Test Certificates issued by Dr Terry Lucke and Mark Alexander are available on the AHSCA Research Foundation's website at the following web address:

<https://www.ahscaresearch.com.au/dam-buster-rainheads/>

NOTE: The AHSCA-RF also tested the 200-1 rainhead for normal flow capacity with a 100x50mm DP since although 3500.3 permits the usage of this size DP, the 3500.3 design charts have not been updated to include this size.



Testing of Dam Buster box gutter overflow devices B and C by Dr Keller

Dam Buster P/L carried out testing of overflow devices B (overflow device comprising a Dam Buster Side Outlet and a Dam Buster Rainhead) and C (Dam Buster Sump) in a custom built flow test rig located in Clayton, Victoria and assembled by Dam Buster P/L. The flow rates were measured using a Flexim Fluxus F601 ultrasonic transit time flow meter, sourced from PriCam Automation P/L, and installed by a technical representative from this company. The flow meter has a stated accuracy of +/- 1%. All testing was independently supervised and witnessed by Dr Keller, and this testing formed the basis of his Expert Opinion for devices B and C.

Evaluation of Dam Buster device D (Dam Buster Elbow) by Dr Keller

Development of device D (the Dam Buster Elbow) was initiated on the basis of the results of the physical testing of the Dam Buster device C, as the Elbow is hydraulically similar to the Side Outlet device B. A numerical analysis of the Dam Buster Elbow was carried out by Dr Keller to ensure backwatering (i.e. the impeding of hydraulic free flow) could not occur in the Dam Buster Elbow. The calculations demonstrated that the head loss in the bend is always significantly less than the step down / 'drop' between the 'upstream' (or 'upper') and the 'downstream' (or 'lower') box gutter. This modelling and analysis by Dr Keller formed the basis of the certification and constraints associated with the usage of the Dam Buster Elbow device.

Physical testing of device D was later carried out in a purpose-built test rig located in Kalorama (Victoria), and the flow rates were also measured using the same instrument as for devices B and C. This testing was supervised and witnessed by Dr Keller.

The physical testing produced results which aligned well with the theoretical hydraulic analyses by Dr Keller. Of particular interest was the maximum water level in the Elbow, which occurred at and near the outer corner of the Elbow where the water changes directions (i.e. immediately downstream of the step down, at the Elbow wall impacted by the discharge). An analysis of the water level at this location, taking into account Dam Buster's design criteria and Elbow geometry, identified that the freeboard at this critical design location was more than satisfactory, and well within the expectations of 3500.3. The detailed review and commentary of the Elbow by Dr Keller also considered the potential effects of debris within the gutter and noted that "*the turbulence generated by the drop was expected to assist with preventing debris from accumulating in the Elbow and clearing debris in the Elbow*".



6.0 MANUFACTURE OF DAM BUSTER PRODUCTS

All Dam Buster licensed manufacturers are subject to strict manufacturing requirements, and Dam Buster maintains close communication with its fabricators to provide technical assistance, and also to ensure that a high quality of the Dam Buster products is maintained. All manufacturing and assembly is carried out in Australia using Australian BlueScope steel products. Sealed aluminium rivets used in assembly of Dam Buster products are sourced from companies having ISO9001 Quality Certification. All Dam Buster products carry clear identification.

7.0 DESIGN & INSTALLATION OF DAM BUSTER PRODUCTS

Design of Dam Buster products should only be carried out in accordance with the **Product Technical Statement** by competent users of AS/NZS 3500.3.

All Dam Buster products must be installed strictly in accordance with the **Dam Buster Roof Drainage System Installation Manual** and the associated box gutters must all be installed in accordance with all relevant codes and standards, as prescribed by the relevant state or territory.

Failure for the Dam Buster devices not to be selected / designed as specified above, or failure to install the devices in accordance with Dam Buster's Installation Manual, will void any warranty on the Dam Buster products and further, Dam Buster Pty Ltd and Dam Buster IP Pty Ltd will not be responsible for any losses whatsoever arising from such failure/s, no matter what their nature, nor how caused.

8.0 LIMITATIONS AND CONDITIONS

Dam Buster products are designed for use in strict compliance with all relevant Australian and New Zealand standards including, but not restricted to, AS/NZS 3500.3. They must not be used for any other purpose or in any way except as permitted in the publication titled '*Dam Buster Product Technical Statement*'. It is the responsibility of the roof plumber and builder to ensure full compliance with this document and with all relevant Australian and New Zealand standards.



9.0 INTELLECTUAL PROPERTY AND KNOW-HOW

Dam Buster is a registered Trademark both in Australia and Overseas, and all Dam Buster products are also protected by a comprehensive range of Australian and Overseas patents. Breaches of Intellectual Property and Know-How rights are serious and will be pursued by Dam Buster Pty Ltd / Dam Buster IP Pty Ltd against any infringers.

With the exception of the AHSCA-RF Overflow Performance Certificates, Dam Buster has chosen not to make testing data which provides evidence of compliance of the Dam Buster products publicly available, due to this being confidential information.