BUILDING MATTER – Roof drainage design using a box gutter system

PROJECT ADDRESS

_____

_____

PROJECT DETAILS

Detail	Description		
BCA Applicable:	Building Code of Australia, Volume 1 – 2022 ☐ Building Code of Australia, Volume 2 – 2022 ☐ Plumbing Code of Australia– 2022 ☐		
Classification (s):	**Part of building**	**BCA Classification**	**Description**
	Roof	Class	
	Roof	Class	
Storeys contained:			
Rise in storeys:	(for Class 2-9 buildings only)		
Effective Height:	(for Class 2-9 buildings only)		
Type of Construction:	(for Class 2-9 buildings only)		

BUILDING SURVEYOR / BUILDING CERTIFIER

Name: _____

Company: _____ Phone No: _____

Licensing authority: _____ Registration # _____

SCOPE

This PBDB relates to the design of a box gutter system forming part or all of the roof drainage system for the subject property.

Roof drainage is regulated in the states and territories of Australia in different ways. The NCC provides Deemed-To-Satisfy solutions for box gutter systems using the following acceptable construction manual, applicable in all states and territories:-

AS/NZS 3500.3 *Plumbing and drainage Part 3: Stormwater drainage*

Additionally, the following handbooks are also applicable in some states and territories:-

SA HB 39 *Installation code for metal roof and wall cladding*

SAA/SNZ HB114 *Guidelines for the design of eaves and box gutters*

PROBLEM

DtS box gutter solution is not suitable for roof layout and / or is not aesthetically acceptable

Available DtS box gutter solutions provided in AS/NZS 3500.3 ('3500.3') are limited to the following three prescriptive box gutter overflow devices only:

- Open fronted rainhead in accordance with Figure 3.7.3 (a) of 3500.3
- Sump / side overflow device in accordance with Figure 3.7.3 (b) of 3500.3
- Sump / high capacity overflow device in accordance with Figure 3.7.3 (c) of 3500.3

Further information on DtS box gutter systems is provided in the BPC's Plumbing Practice Note RP-02: Box Gutters. Whilst this is a Victorian publication, it provides a general overview of the available box gutter overflow devices in 3500.3. Note, the Building and Plumbing Commission ('BPC') was formerly known as the Victorian Building Authority ('VBA').

https://www.vba.vic.gov.au/__data/assets/pdf_file/0009/135684/Plumbing_RP-02_Box-Gutters_CURRENT_01-Aug-2023.pdf

The available DtS solutions for box gutter overflow devices provided in 3500.3 are very limiting with respect to the design of roof drainage, and the following is noted in particular:

- The rainhead in accordance with Figure 3.7.3 (a) of 3500.3 is generally not aesthetically acceptable because it is open fronted
- Clause 3.7.6 (g) *Layout* (i) states *'Box gutters shall be straight (without change in direction')* and none of the 3500.3 devices facilitate a change in direction of box gutters
- Further to the above, clause 4.7.1 of 3500.3 states '*Gutters shall not be jointed along the length to increase the gutter depth'*. However, this may be necessary in order to achieve a change in direction.
- The 3500.3 sumps cannot be standardized as they must be designed integrally with the box gutter. Consequently, they are not available commercially as standard sizes and must be fabricated individually. Additionally, the Sump / high capacity device is complicated to fabricate.

The Dam Buster range of products has been developed in order to overcome the above issues and provide a tested and quality-controlled manufactured product with known design capacities that provides a far greater level of certainty that roof drainage elements meeting the correct design criteria in accordance with the design flow capacity requirements of AS/NZS 3500.3 are installed.

COMPARISON OF DAM BUSTER PRODUCTS TO AS/NZS 3500.3

Dam Buster products meet the following underlying fundamental requirements of AS/NZS 3500.3:

- The products are designed for a minimum design flow rate of 3.0 L/s
- The maximum allowable flow rate is 16.0 L/s
- The following freeboards apply to the box gutter overflow devices in AS/NZS 3500.3 (although these are not explicitly stated in the code)
    - Normal flow condition (free flow)
        - 60mm for all three box gutter overflow devices
    - Overflow condition
        - 60mm for the Rainhead
        - 45mm for the Sump / High-Capacity overflow device
        - 30mm for the Sump / Side Outlet

- All Dam Buster devices are free flow in both the normal and overflow condition and are designed for 60mm freeboard.
- The overflow capacity is at least equal to the design flow capacity

Although Dam Buster devices meet all the fundamental underlying principles and requirements of AS/NZS 3500.3, the BPC does not consider that the products can be assessed under NCC Governing Requirement A2G3 (2) (b) *Expert Judgement* as being a Deemed-to-Satisfy Solution. This position, however, does vary between regulators, certifiers and building surveyors. Therefore, appropriate advice should be obtained as required because a Performance Solution may not actually be required. This Performance Based Design Brief is, however, being supplied on the basis that a Performance Solution is required at the subject property.

RELEVANT PERFORMANCE REQUIREMENTS

The relevant Performance Requirements are as follows, depending on which volume of the NCC the building is being assessed for, and in the case of Volume 3, whether the building is located in Victoria or Tasmania. Refer also to the Final Report for further details of the Performance Requirements relating to the subject building.

NCC-2022 Volume 1 (**BCA Volume 1**)

- Part F1 – Surface water management, rising damp and external waterproofing
  - Performance Requirement
    - F1P2 Preventing rainwater entering buildings.

NCC-2022 Volume 2 (**BCA Volume 2**)

- Part H2 – Damp and weatherproofing
  - Performance Requirements
    - H2P1 Rainwater management
    - H2P2 Weatherproofing

NCC-2022 Volume 3 (**PCA**) – Victorian state addition

- Vic Part E3 Stormwater – Roof drainage systems
  - Performance Requirements
    - Vic E3P1 Roof drainage systems
    - Vic E3P2 Overflow
    - Vic E3P3 Watertightness
    - Vic E3P4 Design, construction, and installation

Identify the relevant NCC volume(s) and Performance Requirements.

Note
In Victoria & Tasmania, where Volume 1 or 2 is referenced, Volume 3 should also be referenced. This is because it is necessary to comply with both the Building Regulations and Plumbing Regulations in these states. BCA Vols 1 & 2 are referenced under the Building Regulations and the PCA is referenced under the Plumbing Regulations.

NCC-2022 Volume 3 (**PCA**) – Tasmanian state addition

- Vic Part E3 Stormwater – Roof drainage systems
  - Performance Requirements
    - Tas E3P1 Roof drainage systems
    - Tas E3P2 Overflow
    - Tas E3P3 Watertightness
    - Tas E3P4 Design, construction, and installation

RELEVANT DtS PROVISIONS

This Performance Solution seeks a variation to the following relevant DtS provisions in NCC2022 to permit box gutters discharging as follows (where applicable):

(i) Into a Dam Buster Rainhead, and

(ii) Into a Dam Buster Sump, and

(iii) Into a Dam Buster Elbow or Dam Buster Junction (change of direction devices), and

(iv) Into a box gutter overflow device comprising a Dam Buster Side Outlet and a Dam Buster Rainhead (also a change of direction device)

BCA Volume 1

- All States & Territories
  - Section F Health and Amenity
    - Part F1D3 *Stormwater drainage*

BCA Volume 2

- All States & Territories, unless noted in the Schedule below
  - Part H2 *Damp and weatherproofing*
    - H2D2 *Drainage*
    - H2D6 *Roof and wall cladding*
- Schedule 10 - Victoria
  - Part H2 *Damp and weatherproofing*
    - *VIC H2D6 Roof and wall cladding*

PCA

- All States & Territories
  - Not applicable, except for the Tasmanian & Victorian State Additions ,as below
- Schedule 9 - Tasmania
  - Part E3 *Stormwater – Roof drainage systems*
    - *TAS E3P1 Roof drainage systems*
    - *TAS E3P2 Overflow*
    - *TAS E3P3 Watertightness*
    - *TAS E3D2 General requirements*
- Schedule 10 - Victoria
  - Part E3 *Stormwater – Roof drainage systems*
    - *VIC E3P1 Roof drainage systems*
    - *VIC E3P2 Overflow*
    - *VIC E3P3 Watertightness*
    - *VIC E3D2 General requirements*

PROPOSED ASSESSMENT METHOD IN ACCORDANCE WITH THE GOVERNING REQUIREMENTS OF THE NCC

The following assessment method is proposed:

A2G2 (2) Performance Solution parts (a), (c) and (d)

(a) Evidence of Suitability in accordance with part A5 (refer to further details below)

(c) Expert Judgement

(d) Comparison with the Deemed-to-Satisfy Provisions

Part A5G3 Evidence of suitability – BCA Volumes 1 and 2

A5G3 (1) (e) A certificate or report from a professional engineer or other appropriately qualified person, and

A5G3 (1) (f) Another form of documentary evidence, such as but not limited to a Product Technical Statement

Part A5G4 – Evidence of Suitability - PCA

A5G4 (6) Evidence to support that a design or system meets the relevant PCA Performance Requirements must be in the form of one or any combination of the following:

(b) The design or system is a Performance Solution from a professional engineer or recognized expert

and

A5G4 (c) Any other form of documentary evidence (a Product Technica Statement)

ANALYTICAL ASSESSMENT PROCESS & ACCEPTANCE CRITERIA

The acceptance criteria for Dam Buster products is by way of comparison of the Dam Buster devices with the key requirements of AS/NZS 3500.3-2025 *Stormwater drainage* code, which is a Deemed-to-Satisfy Solution for all of the above Performance Requirements. Refer to the current Dam Buster 'Evidence of Suitability' document located at:

https://www.dambuster.com.au/technical-downloads/

This comparison has generally been carried out by Dam Buster's (independent) expert, Adjunct Associate Professor Robert Keller, by means of physical testing and hydraulic analysis and computations, as well as detailed comparisons to 3500.3. Testing and analysis of the overflow performance of Dam Buster rainheads was carried out by Professor Terry Lucke, AHSCA Research Foundation, at their test rig built in conjunction with the University of the Sunshine Coast. This testing was reviewed and considered by A/P Robert Keller during his assessment of Dam Buster's products.

KEY STAKEHOLDERS (strike out whichever is not applicable)

Building owner / building owner's representative

Name: _____

Company: _____ Phone No: _____

Signed: _____ Date: _____

Roof drainage designer - Civil / Hydraulic Engineer or Roof plumber

Name: _____

Company: _____ Phone No: _____

Registration Category: _____ Registration # _____

Signed: _____ Date: _____

Architect / Building Designer

Name: _____

Company: _____ Phone No: _____

Signed: _____ Date: _____

Builder

Name: _____

Company: _____ Phone No: _____

Signed: _____ Date: _____

Other (specify)

Name: _____

Company: _____ Phone No: _____

Role in project: _____

Signed: _____ Date: _____