



High Front Guttering Advisory Committee Report
on the review and use of high front guttering
in New South Wales

January 2011

The Committee

The High Front Guttering Advisory Committee is comprised of three members:

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Perry has a strong mix of research, teaching, academic, managerial and practical experience obtained in the construction industry over a 30 year period. This stems from initiation at trade level followed by senior management positions in design, construction, estimating, project management and consultancy organisations. He has advised many leading companies and government bodies both within Australia and overseas on construction efficiency, building technology issues, construction estimating, product development, construction related software development and management systems. He has been a central figure in the development of a number of new building systems. Coupled with the above, Perry is an Associate Professor and Head of School at the School of the Built Environment, University of Technology Sydney. He is a Churchill Fellow as well as being a Fellow of both the Australian Institute of Building and the Australian Property Institute. He has received a number of industry awards and has published widely on construction related matters including over 44 articles covering leading international journals and conferences, as well as educational and industry publications. Of note, this includes co-development of a multimedia version of the Installation Code for Metal Roofing and Wall Cladding, for Standards Australia.

Ms Jan McClelland

Jan has extensive experience in providing strategic management consultancy services to government agencies, higher education institutions and private sector organisations. She has particular expertise in undertaking strategic reviews and evaluations of organisation functions, policies, programs and structures involving complex and sensitive issues, extensive legislative and regulatory frameworks and wide ranging stakeholder consultations. Previous reviews have included a review of mine safety, a review of the Coroner's Court, a review of the Consumer Trader and Tenancy Tribunal, a review of the Code of Banking Practice, a review of consumer credit reporting and marketing and reviews of police and medical education. Jan is a former Director-General of the New South Wales Department of Education and Training and the Managing Director of TAFE NSW and senior executive in the New South Wales public sector. She holds directorships on a number of boards in the private, public and not-for profit sectors. Jan has a Bachelor of Arts (Hons) and a Bachelor of Legal Studies. She is a Fellow of the Australian College of Educational Leaders, a Fellow of the Australian Institute of Management and a Member of the Australian Institute of Company Directors.

Mr Warwick Neilley

Warwick has extensive experience in advising on best practice service delivery, with major strengths in the health, housing and construction industries. Warwick has strong expertise in business processes reviews, including compliance with government legislation and regulations. Warwick worked as a Senior Adviser to NSW Ministers and then Premier Iemma from mid 1997 to September 2008. Prior to becoming a Senior Adviser to NSW Government Ministers he was a Member of the Inquiry into Outstanding Grievances with the Building Services Corporation which was appointed to deal with a large number of unresolved consumer grievances with that organisation. Whilst working as a Senior Adviser to the NSW Government he assisted with the development of the construction industry Security of Payment legislation and the Contractor Best Practice Accreditation Program. Prior to joining the NSW Government he was Adviser to Federal Government's Housing Industry Best Practice Guide (1996); an Accredited Consultant on Building Industry Enterprise Best Practice, Construction Industry Development Agency (CIDA) (1993-95); National Convenor, Federal Government's Construction Industry Workplace Reform Advisers Network (1990-1993); was the Housing Industry Training Foundation's Principal Consultant on trades training reform (1990-1995), and wrote the "Cost Differentials in the housing industry-labour market issues" paper (Occasional Series 6, Federal Department of Local Government and Urban Development, Australian Housing Industry Development Council, 1994). Warwick has a Master of Health Administration (UNSW) and a Bachelor of Engineering, Chemical Engineering (Hons) (UNSW)

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Executive Summary

High fronted guttering systems have been in widespread use across Australia for almost 20 years. Publicly stated concerns that this guttering does not comply with regulatory requirements prompted the NSW Minister for Fair Trading to instruct NSW Fair Trading to establish a Review Advisory Committee. The Committee was established in late 2010 and investigated whether or not *high fronted guttering* installed in residential dwellings in New South Wales posed a systemic problem in terms of compliance with regulations - specifically the Building Code of Australia (BCA).

A wide range of information was considered including documents and data collected by NSW Fair Trading on consumer complaints and media, political and industry debate on *high fronted guttering* issues and cases and files from NSW Fair Trading's *Operation Flow* which checked compliance relating to a number of display homes. In addition, the Committee received submissions from and met with major manufacturers, relevant industry bodies and other interested parties. The Committee wrote to all NSW Councils inviting them to make a presentation or submissions and sought independent technical advice concerning an audit of Fair Trading's *Operation Flow*. Further, the Committee examined and assessed the consistency and adequacy of the regulatory framework for the design and installation of *high fronted guttering* including the principal governing legislation being the Home Building Act 1989; and related legislation and codes such as the Trade Practices Act 1974, licensing regulations, the BCA, Australian Standards, the Plumbing Code of Australia and the NSW Plumbing and Drainage Code of Practice. This included meetings with relevant government agencies and consideration of independent legal advice on the relative status of each of these regulatory instruments in relation to *high fronted guttering*.

In undertaking the brief, the review focused primarily on compliance with BCA performance requirements (in Section 2 of the BCA) – being the only mandatory requirements in the BCA. For *high fronted guttering* the main requirement of interest is to keep water out of the building based on a 100 year Annual Recurrent Interval (ARI) rain event. Such performance requirements aim to be non-prescriptive – they tell designers and installers the outcome that must be achieved but avoid prescribing how to actually achieve it. Information and advice on options for achieving the performance requirements is reserved for the “Building Solutions” level of the BCA’s compliance hierarchy. This level contains a variety of *Deemed to Satisfy* solutions where individuals can choose which they prefer to use on a project by project basis. Such solutions include the BCA’s own “Acceptable Construction Practice” (in section 3 of the BCA) and Australian Standards AS3500.3/3500.5. These options provide a more prescriptive level of detail about how to construct guttering in a way that can meet BCA performance requirements.

An overriding conclusion from the Committee is that there is no evidence of a systemic problem concerning *high fronted guttering* based on BCA performance requirements. It is also the Committee’s opinion that the BCA performance requirements have often been overlooked in the debate about systemic problems with *high fronted guttering* - the focus having been on the prescriptive requirements contained in *Deemed to Satisfy* solutions such as in AS3500.3/3500.5 and the “Acceptable Construction Practice”. Though issues pertaining to the relationship and status of these documents with BCA performance requirements need to be resolved and have been addressed by the Committee, over emphasis on details within them has at times confused rather than clarified the central issue concerning consideration of a systemic performance problem regarding *high fronted guttering*.

While overflow measures are critically important to the performance of *high fronted guttering*, to some extent there has been a lack of fit on this issue between the BCA performance requirements and the *Deemed to Satisfy* options such as in AS3500.3/3500.5 and the “Acceptable Construction Practice”. The past reference in the “Acceptable Construction Practice” to the use of slotted gutters is a good example of where this misfit has led inadvertently to the conclusion on the part of some manufacturers and installers that slotted gutters in themselves provide overflow measures that meet BCA performance requirements (slots should have been dealt with in a more measurable way especially in proving the degree of contribution they may have to meeting performance requirements).

In general, the *Deemed to Satisfy* options focus on designing guttering and downpipes for a 20 year ARI but are vague in objectively dealing with overflow – albeit that this is critically important in the case of *high fronted guttering* so as to prevent water entry into the building based on the 100 year ARI. There is also a degree of concern by the Committee of a lack of understanding and adherence in the industry concerning the use of *Deemed to Satisfy* solutions and the calculation methods involved in specifying the gutter size and number of downpipes to suit the roof area for a given 20 year ARI. Though evidence that is able to be generalised here is limited, there is concern primarily about a lack of downpipes to adequately remove water from gutters. Again, *high fronted guttering* is more sensitive to the effects of such a problem due to the ramifications that this presents for overflow entry into a building. To an unknown extent, informal overflow mechanisms detailed in the report (that are not normally counted in overflow management) may assist in mitigating the chances of such overflow.

Key recommendations arising from the review include:

Overflow

1. That consideration be given by the Australian Building Codes Board to ensuring that all Building Solutions (especially *Deemed to Satisfy* solutions) that use *high fronted guttering* be designed to have the capacity to accommodate the building’s location 100 year ARI.
2. That overflow requirements be stated in quantifiable and measurable terms in *Deemed to Satisfy* solutions, to prove that performance of one or more options will meet the 100 year ARI.
3. In conjunction with the previous recommendation, that the Australian Building Codes Board (including input from industry, government and consumers) give consideration to and debate different means of meeting the above overflow requirements – such as increasing the design capacity of *high fronted guttering* from the 20 year ARI to the 100 year ARI. This should include debate and consideration of the ramifications of continuous versus location specific overflow.
4. That, recognising the responsibility for the correct installation of guttering and downpipes under the Environment Planning and Assessment Act and the Home Building Act 1989 lies with building practitioners and licensed contractors, to assist, manufacturers should be required to test and publish design information including cross sectional gutter areas and

overflow rates for their preferred overflow provisions e.g. set down below the top of the fascia clips, flashing, gutter slots, fascia-gutter spacers, inverted nozzles, rain water heads etc.

Slots

5. That consideration be given by the Australian Building Codes Board and Standards Australia to clarifying that slots in and of themselves are not necessarily a means of meeting BCA performance requirements.
6. That, like all other solutions and consistent with Recommendation 2 above, slots should be assessed in terms of meeting measurable overflow rates. This should include attention to the rate of overflow achieved for a given slot size, slot spacing and slot location.
7. That where measures indicate slots provide inadequate overflow rates, designers need to aggregate this option with others or simply use a better performing option to meet required overflow rate measures.

Consistency and Clarification of Standards

8. That Standards Australia and the Australian Building Codes Board review the need for greater consistency between AS3500.3/3500.5, especially with regard to overflow and its application to *high fronted guttering*.

Strengthened Certification Provisions

9. That NSW Fair Trading and Planning NSW jointly consider the most appropriate way to secure compliance with BCA performance requirements for the design and installation of gutters, downpipes and overflow measures (this could be done in conjunction with the adequacy of rainwater retention systems), as a criteria for the issuing of Construction Certificates for all home building work in NSW that includes *high fronted guttering*.

Replacement Guttering

10. That NSW Fair Trading write to all relevant licence holders (Builders, Roof Plumbers and Plumbers) to remind them that all guttering replacement works they carry out have to comply with the BCA, including downpipe capacity and appropriate provision for overflow, and that all such works need to be carried out by appropriately licensed contractors.

Industry Skills, Education and Training

11. That NSW Fair Trading, NSW TAFE, manufacturers and industry bodies assess whether or not there is a prospective shortfall in labour supply, and develop and implement training programs to ensure the supply of licensed contractors. Such training should include a full understanding of the BCA performance requirements, how building solutions (especially *Deemed to Satisfy* solutions) serve to meet these requirements and how to calculate *Deemed to Satisfy* gutter, downpipe and overflow requirements.

12. That NSW Fair Trading, NSW TAFE, manufacturers and industry bodies also develop appropriate training programs for existing licence holders including top up training to meet any perceived knowledge gap and continuous education and training programs.
13. That NSW Fair Trading undertake an audit of the extent to which installers hold appropriate licences, and take appropriate enforcement action on unlicensed installers.
14. That NSW Fair Trading take on the role of issuing direct advice to all relevant licence holders of changes made to the BCA (and National Construction Code in the near future) and AS3500 that have a bearing on the installation of gutters and downpipes, and that contract holders be required to acknowledge that they have received such direct advice as part of maintaining their status as a licensed contactor in NSW.

1 Background

The following includes paraphrased points from the “Terms of Reference” contained in Appendix A.

- *High fronted guttering* systems have been supplied and fitted on a widespread basis across Australia for almost 20 years. The BCA provides a legislated basis for setting minimum mandatory levels of guttering performance. The BCA provides different methods of providing appropriate building solutions that comply with performance requirements. *Deemed to Satisfy* options include the BCA’s own Acceptable Construction Practices and Australian Standard AS3500. Both options state the need for guttering systems to adequately manage overflow from gutters.
- In 2008, claims were made by a building practitioner that *high fronted guttering* design and installation methods, in widespread use throughout NSW, did not meet BCA requirements. Concerns were particularly raised about the adequacy of slots in *high fronted guttering* as the single, appropriate overflow measure.
- NSW Fair Trading is of the view that slots in *high fronted guttering* are only one of a range of measures advised in the BCA and in AS3500 for dealing appropriately with overflow. Overflow systems must be designed and installed in compliance with meeting BCA performance requirements.
- Nevertheless in response to the claims made in 2008, NSW Fair Trading convened a forum with all major industry stakeholders, insurers, manufacturers and government agencies. The forum concluded that there was no evidence at hand to suggest that *high fronted guttering* was a systemic failure issue in NSW i.e. the forum did not uncover any evidence to suggest that the installation of *high fronted guttering* was creating widespread overflow problems leading to water ingress into residential buildings in either NSW or elsewhere in Australia.
- Notwithstanding, the forum did conclude that an amendment to the BCA was required to remove its existing advice on “slotted guttering”. The forum was of the view that the existing reference to slotted guttering in the BCA may mislead building practitioners into believing that slotted gutters on their own would satisfy the BCA’s performance requirements. NSW Fair Trading made a representation to the Australian Building Codes Board that this matter be addressed.
- In addition to holding the forum, NSW Fair Trading and other NSW agencies implemented the following measures:
 - in conjunction with the Master Plumbers Association of NSW produced a circular to remind roof plumbers about the codes and standards for installing gutters;
 - placed installation guidelines with example diagrams from AS3500 on its website;
 - wrote to over 150 councils across NSW reminding them of the need for council certifiers to check guttering against the codes and standards and inviting them to forward the details of any cases where it was believed that property damage has occurred due to inadequate gutters;
 - consulted with builders and tradespersons at trade seminars during 2008-2009;
 - discussed the issue with regulators from other States and Territories; and

- the Building Professionals Board and the Department of Planning issued a circular to all private certifiers, councils and building practitioners on this issue.
- In early 2009 the Australian Building Codes Board removed any inference in the BCA that slots in *high fronted guttering* were sufficient as an appropriate, single measure to deal with overflow.
- During the second half of 2009 NSW Fair Trading conducted an online survey of licence holders and homeowners to seek evidence of any widespread problem. The survey closed at the end of January 2010. Because of the very small number of respondents, the results were inconclusive.
- Nevertheless, the survey responses from builders and plumbers indicated that some designers of guttering may not be applying the BCA requirements. In light of this, NSW Fair Trading inspected guttering on builders' display homes across NSW to assess whether designs for *high fronted guttering* systems were compliant with the requirements outlined in AS3500.
- The NSW Fair Trading inspectors have reported that guttering designs for a high number of display homes may be not compliant. Fair Trading wrote to the major builders involved seeking their comments.
- In order to seek additional, independent, advice the NSW Minister for Fair Trading instructed NSW Fair Trading that they establish a Review Advisory Committee – this report is the key outcome of the Committee's work.

2 Scope of the Review

The Advisory Committee was asked to conduct a review of remaining concerns that *high fronted guttering* installed in residential dwellings in New South Wales is defective, and that evidence exists that there is a systemic problem with the installation of *high fronted guttering*.

3 Review process

In undertaking the Review the Committee:

- Examined all evidence collected by the Department of Services, Technology and Administration (NSW Fair Trading) including:
 - Correspondence, minutes of meetings and media coverage of *high fronted guttering* issues;
 - Quantitative data on consumer complaints involving *high fronted guttering* matters;
 - Individual cases concerning *high fronted guttering*; and
 - Files on *Operation Flow* conducted in July 2010, in which display homes were inspected for compliance with the BCA and AS3500. (The process and outcomes of *Operation Flow* are discussed in more detail in Section 7.3 of this report.)
- Received submissions from and met with major manufacturers, relevant industry bodies and other interested parties to gain their advice and any evidence of non-compliance in residential building work with existing codes and standards, or any deficiencies in adequately regulating this aspect of residential building construction. Eighteen submissions

were received including six from manufacturers, seven from industry associations, two from contracting and consultancy firms, and three from individuals including a builder, an academic and an architect.

- Sought independent technical advice concerning an audit of NSW Fair Trading's *Operation Flow* which involved an assessment of gutter size and downpipe compliance – based on the BCA and AS3500 compliance of the previously mentioned display homes.
- Wrote to all NSW Councils inviting them to make a presentation or submission on whether *high fronted guttering* and failure to appropriately deal with overflow is an issue in their area, specifically if Councils were aware of any individual instances where the installation of *high fronted guttering* has been identified as the source of damage to a residential dwelling, or whether Councils had taken any formal action, such as policy changes, in relation to *high fronted guttering* that the Committee should be aware of. Responses were received from nine Councils.
- Examined and assessed the consistency and adequacy of the regulatory framework for the design and installation of *high fronted guttering* including legislation, codes and standards that may have an impact, such as the Home Building Act 1989, Trade Practices Act 1974, licensing regulations, the BCA, Australian Standards, the Plumbing Code of Australia and the NSW Plumbing and Drainage Code of Practice. This included meetings with relevant government agencies and consideration of independent legal advice on the relative status of each of these regulatory instruments in relation to *high fronted guttering*.
- Examined data and practice in other States and Territories and considered the implications of the National Occupational Licensing System (NOLS) and proposed legislative changes in NSW relating to the licensing of plumbers and roof plumbers.
- Examined industry innovations in relation to measures to prevent gutter overflow into buildings in high rainfall situations.

A list of organisations and individuals consulted by the Committee is provided at Appendix B of this report.

4 Defining a Systemic Problem – Implicating the Regulatory Framework

In order to properly consider the scope of the review there is first the need to define what constitutes a “systemic problem” with regard to *high fronted guttering*. The Committee concluded that the only appropriate methodology was to refer to the regulatory frameworks for home building as a reference point for defining a “systemic problem”.

In this endeavour it became evident that two parallel regulatory frameworks in NSW may be a source of confusion in arriving at a definition of a “systemic problem”. The relevant frameworks are: The BCA and the NSW Plumbing and Drainage Code of Practice (Code of Practice). For instance, under the BCA “a systemic problem” can be defined in terms of work not meeting performance requirements, whilst the Code of Practice requires an approach that is not driven by performance requirements but instead, more detailed and prescriptive design requirements.

Here, it is notable that the BCA and Code of Practice both call up AS3500 (ostensibly AS3500.3/3500.5 are the main parts of relevance) as a means of proving compliance. However, in the case of the BCA, this Standard is called up as one of the *Deemed to Satisfy* options and therefore

sits below higher level performance requirements. Of note, the Standard only represents one pathway for meeting performance requirements, not the only pathway. In contrast, the Code of Practice calls up AS3500 in a more prescriptive way that does not allow alternative methods of construction – compliance with AS3500 is the only way. Here, the Code of Practice itself provides no specific, direct guidance on the design and installation of guttering and so it is only via AS3500 that it offers any content in terms of gutter related issues at all.

As a result of this situation, it was apparent that the role of AS3500 had to be clarified because of the potential level of importance it held in defining a “systemic problem”. It was apparent to the Committee that the only means of resolving this was to determine whether the BCA or the Code of Practice was a more appropriate regulatory framework with respect to the regulation of guttering in New South Wales.

As a result, the Committee sought a formal opinion on the issue – as provided by the Deputy Commissioner, Fair Trading Operations. It is included in Appendix C of this report. In summary, the opinion states that the BCA is the dominant and most appropriate regulatory framework to apply to guttering work. This is based on guttering (roof plumbing) being defined as “building work”. In addition;

- The Environmental Planning and Assessment Regulation 2000 states that building work requires development consent (including complying and exempt development) and must be carried out in accordance with the BCA.
- The Home Building Act 1989 regulates and licenses guttering as “residential building work” with the BCA forming part of the requirements for quality of construction.
- The Water Authorities that empower the use of the Code of Practice as a regulatory document are not mandated to, and do not actively, regulate guttering installation work.

Given the above, a “systemic problem” in *high fronted guttering* is henceforth defined in terms of work not meeting performance requirements in the BCA. This includes attention to:

- New Housing construction (referred to as Class 1 building work in the BCA)
- The replacement of gutters in existing housing (such work is considered “new work” under the EPA regulation and as advised by Planning NSW).
- The words “systemic problem” be taken to indicate a high predictability of failure - as evidenced by sufficient quantifiable evidence to be statistically significant. This notably deviates from random or isolated project failures.

Further to the above there is a need to set boundaries concerning the scope of the guttering system and its interface with other building systems. In this context, the investigation deals with the function of *high fronted gutters* and the exit of water from those gutters into downpipes. The investigation does not include the performance of adjoining systems such as stormwater pipe systems and rainwater storage tanks except to the extent that the under-design of such systems may result in backflow which may cause gutters to overflow. Examples mentioned to the Committee on this issue included:

- Unworkable stormwater outfall – this example concerned stormwater from a dwelling that discharged into a lagoon prone to tidal action - high tides created sufficient reverse pressure

from the tidal “head” to prevent the stormwater from discharging into the lagoon – thus causing backflow

- Water storage tanks – this example concerned where a full tank could not discharge overflow water at a rate that was equal to the rate that water was entering from gutters, thus creating a backflow effect.

Such problems are not considered to be a “systemic problem” of *high fronted guttering* but rather a fault of these downstream systems. The same basic logic also applies to the fitting and function of gutter leaf guard systems. In addition, some guttering systems – mainly in rural areas – try to avoid overflow and instead overdesign gutter and downpipe capacity in an effort to harvest and store as much water as possible. Though the Committee was open to finding out about problems in this area, it was apparent that design requirements for this purpose tended to have a different focus compared to the sort of common issues that may result in the systemic failure of *high fronted guttering*.

5 The BCA and its Context Concerning High- Fronted Guttering

The BCA is the main legislative basis for building regulation in New South Wales - Volume 2 deals specifically with housing provisions, and is the only volume of direct relevance in this report.

Because of the importance of the BCA in undertaking the Review, it is important to understand the context and logic of the BCA as a regulatory framework. The BCA, through industry, government and community consultation, sets minimum acceptable technical standards to meet realistic and affordable industry/community expectations (not best practice) that are then adopted as a regulatory framework by State governments (Note: Though the framework includes provision for individual State amendments, no such amendments were noted regarding *high fronted guttering* requirements in New South Wales).

Here, building regulations are often not able to ensure absolute outcomes and as a result, the BCA tends to facilitate regulation based on acceptable levels of risk. In the case of gutters, performance requirements are expressed in terms of the Annual Recurrent Interval (ARI) for intense rain events. From such events, water must not enter the building or adversely affect neighbouring property for a given ARI (further details on this are provided later under this Heading).

It is very important to note that the BCA also adopts a performance-based approach which is set in the context of 4 levels as shown in Figure 1:

1. Objectives – aim to reflect community expectations
2. Functional Statements – describe how a building achieves Objectives
3. Performance Requirements – state mandatory levels of performance for Building Solutions
4. Building Solutions – are solutions that comply with Performance Requirements and may be in the form of *Deemed to Satisfy* solutions or Alternative Solutions or a combination of both

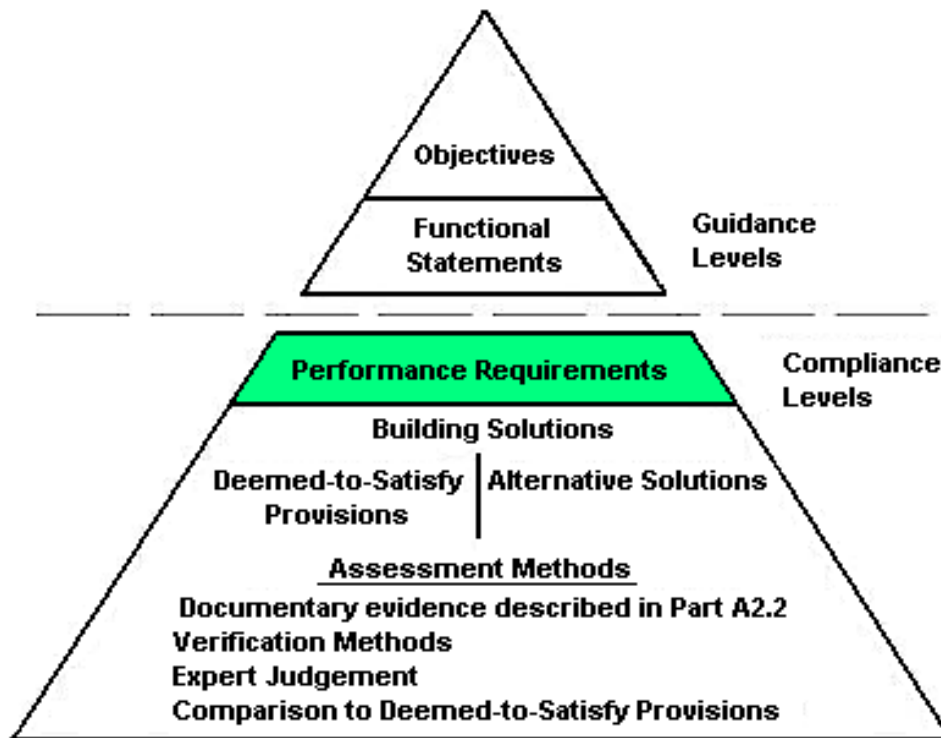


Figure 1: BCA Hierarchy

Of the above, the 3rd and 4th levels are the only ones of primary interest to this report. Here, the 3rd level (Performance level) is the **only mandatory level** in the entire hierarchy whilst the 4th level allows for multiple “building solutions” to meet the mandatory performance requirements.

Importantly, the performance requirements aim to be non-prescriptive – they tell designers the outcome that must be achieved (which of note excludes comment on durability issues). The requirements purposely avoid prescribing how to actually achieve it as this is reserved for the Building Solutions level. In a combined sense, performance requirements and building solutions aim to provide a flexible and progressive means for managing compliance.

Performance requirements are particularly important to consider when assessing the presence or otherwise of a “systemic problem” in the function of *high fronted guttering*. With regard to this, the performance requirements for guttering are contained in Part 2 of the BCA (Volume 2) under P2.2.1 and include:

- I. Surface water, resulting from a storm having an average recurrence interval of 20 years and which is collected or concentrated by a building or site work, must be disposed of in a way that avoids the likelihood of damage or nuisance to any other property
- II. Surface water, resulting from a storm having an average recurrence interval of 100 years must not enter the building
- III. A drainage system for the disposal of surface water must –
 - a. Convey water to an appropriate outfall; and
 - b. Avoid the entry of water into a building; and
 - c. Avoid water damaging the building.

The performance requirement that water must not enter a building based on a 100 year ARI (Item II) is particularly important to *high fronted guttering*. It is notable that this and the other performance requirements do not mention the specific need for overflow at all, but the very nature of *high fronted guttering* as a Building Solution means there is a greater onus on making sure overflow does not enter the building, compared to low front gutters. The Committee is therefore of the view that *high fronted guttering* requires the inclusion of appropriately measurable overflow devices which must be addressed in the Building Solutions level of the hierarchy, to be able to respond to a 100 year ARI event. To place this in further context, most eaves gutters are designed for a 20 year ARI period, with the 20 year ARI for Sydney being 214mm/hour, whilst the 100 year ARI being 273mm/hour (refer BCA Table 3.5.2.2). Hence, all other things being equal, the difference between the two is 59 mm/hour and this amount must be prevented from entering into the building using appropriate overflow devices.

6 Building Solutions to Comply with BCA Performance Requirements

Given the above discussion, it is important to acknowledge that there are a variety of building solutions (guttering solutions) that have relevance to *high fronted guttering*. Such solutions fall into two broad categories including *Deemed to Satisfy* and Alternative Solutions, as dealt with in Figure 1 and further below.

Deemed to Satisfy Solutions

Deemed to Satisfy solutions provide the most common and usually the most predictable means of meeting the BCA's performance requirements. For instance, if designers and contractors follow prescribed requirements, they can say with certainty whether or not the eventual guttering work will predictably meet BCA performance requirements (at least until appropriate weather conditions provide natural testing conditions to see if the guttering works in the likes of a 100 year ARI). In this context, solutions *Deemed to Satisfy* the BCA performance requirements for eaves guttering include:

- Those called up under "Acceptable construction manuals" in Clause 3.5.2.0 of the BCA including AS3500.3/3500.5 ; and
- The BCA's own "Acceptable Construction Practice" which is dealt with under Section 3 of the BCA including clauses 3.5.2.1 to 3.5.2.5.

These options are discussed in detail under headings later in this report because of the ramifications that each has on providing certainty or otherwise in meeting BCA performance requirements. For instance slots in *high fronted guttering* were previously the only mentioned basis for managing overflow in the BCA's own "Acceptable Construction Practice" and this singular mention was finally removed in 2009. The full history of this change is in the chronology provided to the Committee by the Australian Building Codes Board in Appendix D.

Each one of the above options goes about meeting performance requirements with a differing degree of scope, method and prescriptive detail. No single option is more correct than the other in meeting minimum BCA performance standards but one could conceivably argue that certain options provide a higher degree of detail than the other options, or even a higher standard of outcome. In such instances, care must be taken not to confuse higher level outcomes or higher levels of detail as being necessary components in meeting minimum performance requirements. In demonstrating

this point, it is worth reiterating that BCA performance requirements are silent on issues such as gutter durability, maintenance and gutter cleaning, whilst *Deemed to Satisfy* options such as AS3500.3/3500.5 provide greater detail on these issues mainly by way of guideline “notes” or “informative” text. In terms of method, it would seem that AS3500.3 often provides more conservative results when calculating the likes of downpipes compared to the design method used in the BCA under “Acceptable Construction Practice” (refer to Section 7.3) for supportive information on this point). In terms of detail, the BCA’s “Acceptable Construction Practice” occupies only 5 pages of content, whilst the likes of AS3500.5 occupies 32 pages in the roof drainage design and installation sections, plus another 37 pages in associated Appendices “C” to “H”.

Such issues are important in so far as delineating what is directly relevant to assessing a “systemic problem” relative to minimum BCA performance requirements, versus *Deemed to Satisfy* options that may offer higher standards in certain design features or may become immersed in prescriptive detail that may not be directly relevant to the achievement of minimum performance requirements.

Alternative Solutions

In addition to the above, alternative solutions are also possible under the BCA and can be developed to improve cost-effectiveness, improve constructability, incorporate innovation, or address anything different to standard practice. No specific solutions of this nature were identified or presented to the Committee during its Review, though it became apparent that certification of a guttering installation by a hydraulic engineer (or other appropriately qualified expert) may be acceptable as an Alternative Solution, under the assessment methods mentioned in Figure 1 (including expert judgement under BCA Clause 1.0.9). Here, advice from the Building Professionals Board indicates that the Principal Certifying Authority (PCA) on a given project has the right of acceptance or rejection of such a certificate, thus reducing the level of confidence that designers and contractors may have in using this approach as a common means of proving compliance¹.

Notwithstanding this, there is still potential for this approach to be used where needing to prove compliance, especially where *Deemed to Satisfy* solutions have been partially but not fully followed, and in such cases expert input may be appropriate concerning compliance with minimum BCA’s performance requirements.

Closing Thoughts on the Contextual Importance of the BCA

In general and as an adage to the above discussion, it is the Committee’s opinion that the importance of the BCA’s performance driven approach and the structure it provides for multiple methods of proving compliance, has often been overlooked in the debate about systemic problems with *high fronted guttering*. The debate has instead tended to dwell on the prescriptive requirements contained in specific *Deemed to Satisfy* solutions- such as in AS3500.3/3500.5 and the Acceptable Construction Practice part of the BCA. Though issues pertaining to these documents need to be resolved and to this end are discussed in detail later in this report, over emphasis on

¹ One variant on this theme concerned the issuance of “compliance certificates” which PCAs must accept but can only be provided by a certifier appropriately accredited by the Building Professionals Board (BPB). It was advised by the BPB that this is not a commonly used option because of the lack of appropriately accredited certifiers in the hydraulic engineering field and because of risk management reasons (as perceived by those issuing the “compliance certificates”).

them has confused rather than clarified the central issue concerning a “systemic problem” regarding *high fronted guttering*. As detailed previously, this report instead views systemic failure in terms of BCA performance requirements and reiterates that this is the **only mandatory** part of the BCA. Non-compliance with *Deemed to Satisfy* options— such as AS3500 -is only relevant where such documents are used as the stated means of complying with the BCA performance requirements on a specific project. In other instances, such detail is irrelevant.

7 Evidence of Systemic Failure of *High fronted guttering*

Using the previously mentioned onus on BCA performance requirements, the Committee reviewed a number of sources of information discussed under appropriate sub-headings below.

Local Councils

The Committee wrote to all councils in NSW and asked for advice on evidence of *high fronted guttering* problems. None of the nine councils that responded reported examples of specific breaches of the BCA or AS3500.

One council commented that it is possible that some products, which had been installed prior to council having been made aware some 18 months ago that there might be an issue with non-compliance with the BCA or Australian Standards, might not comply. The council has introduced certification requirements for guttering installation similar to those for the installation of BASIX measures, smoke detectors and bushfire protection measures.

One council noted that it was aware from industry association publications that in some cases poorly designed *high fronted guttering* can cause an overflow of water back to the dwelling. The council considers that proper installation of guttering is largely dependent on making home owners aware of the problems associated with *high fronted guttering* and has therefore imposed an advisory note on all approvals: “*Applicants are advised to ensure all gutters are designed and installed in accordance with the BCA and the revised Australian standards.*” The council has also resolved to develop an education /information campaign on *high fronted guttering* including the dangers of guttering that does not comply with the BCA and Australian Standards.

Another council advised that its building surveyors were concerned that many *high fronted guttering* systems were installed contrary to the specific provisions of the BCA and Australian Standards and had recommended that they be banned, subject to similar certification provisions as smoke alarms, or be manufactured differently so that there is a space between the gutter and the fascia board.

NSW Fair Trading Complaints Data

Quantitative data

NSW Fair Trading maintains a database system known as CAS (Customer Assistance Service) to record all enquiries and complaints lodged with Fair Trading. It utilises word searches of the database to determine the incidence of certain types of complaints and has been in use for home building complaints since late 2007. For this reason, searches for guttering complaints were limited to a period from late 2007 to December 2010.

A filtering approach was used by Fair Trading analysts to find relevant cases beginning with the word “gutter” and then using additional words such as “overflow”, “water penetration”, “water ingress” and “water damage” in various permutations. Cases arising from this search were then individually reviewed by Fair Trading analysts to exclude unwanted cases relating to things like road gutters, stormwater gutters and box gutters etc. Ultimately, 34 files that had direct relevance to eaves guttering problems were reviewed personally by the Committee. The Committee found that the

files still contained a variety of cases unrelated to *high fronted guttering* including leaking downpipes, incomplete work and aesthetic problems. On this basis, the Committee found only five specific problems relating to the functional aspects of *high fronted guttering* and a further five where inadequately designed downpipes or similar created adverse conditions likely to directly affect the performance of *high fronted guttering*.

From this data it can be said that there has been a low incidence of complaints registered with NSW Fair Trading concerning *high fronted guttering*. For instance, the database information could potentially cover complaints as much as 10 years old given that work carries a seven year statutory warranty after completion (under Section 18B and 18E of the Home Building Act 1989), and therefore any complaints recorded in 2007 could theoretically span as far back as 2000. Over this period and up to 2010 there has been considerable new housing construction (Australian Bureau of Statistics 87310) and in addition to this, there is consensus from those presenting to the Committee that the gutter replacement market is much larger than the new housing market. As such, it is apparent that the above stated number of complaints represents a very small proportion of overall guttering work over this period.

Case Specific Data

Despite the above over-arching data, the Committee sought out and reviewed information on certain specific cases dealt with by NSW Fair Trading. Though such cases are isolated and as such do not constitute sufficient grounds for substantiating a “systemic problem”, they do provide insight into problematic areas that could be improved regarding the use of *high fronted guttering*. Of note, a number of these cases fall into the category of gutter replacement. Here, it is common for traditional low-front guttering (which automatically provides good overflow characteristics) to be replaced by *high fronted guttering* (where targeted overflow management is more critical). It is apparent from these cases, that there is a greater need to consider not only overflow measures but the design of cross sectional gutter area and downpipe sizes as well (or even additional downpipes). Where *high fronted guttering* replaces existing guttering and no consideration is made of the downpipes and storm water drainage capacity required to get surface water away in conjunction with replacing the guttering, there will always be a high risk of water ingress into the building. In such instances, slots alone may not be adequate in preventing overflow that enters the building. This supports the need for a more measurable approach to overflow devices where *high fronted guttering* is involved in replacing low front gutters.

Operation Flow- A NSW Fair Trading Study of the Building Code of Compliance on Display Homes

NSW Fair Trading Inspectors through *Operation Flow* appraised a range of display homes in mid-2010 throughout NSW (35 in total), concerning their compliance with BCA performance requirements and AS3500 requirements. The main focus was on the number of downpipes and for evidence of overflow measures. Visual inspections of eaves linings and, where it was possible, internal walls and ceilings were conducted for signs of damage through water ingress into the building as a result of overflow.

NSW Fair Trading wrote to builders seeking advice on how they conformed to AS3500 requirements (Note: albeit that this is only one means of meeting BCA performance requirements). Not all had responded at the time of completing this report. Inspectors, through their calculations, advised of widespread under-design of downpipes to meet the AS3500 20 year ARI requirements in the homes appraised. For a small number of homes they also noted signs of water damage to eaves linings, but the causes were not precisely quantified.

Inspectors advised that all homes except for one were not compliant with AS3500 in regard to the adequate provision of downpipes, but then made the additional observations that the majority were compliant with BCA performance requirements i.e. as a result of lack of evidence of water damage from gutter overflow.

The Committee believes these were perhaps lenient interpretations of the BCA and ideally should have checked to determine the maximum rainfall intensity that the homes had been exposed to, in order to draw conclusions about how well the homes were meeting BCA performance requirements. In addition, independent auditing by an expert adviser to the Committee of the calculations made by Inspectors was undertaken on eight dwellings. Though the exact calculations made by the expert varied from those of the inspectors, the expert still agreed with the conclusion that the houses studied did not comply with AS3500.3 or “Acceptable Construction Practice”. It revealed inconsistencies and inaccuracies in the calculations. The expert also said that it is hard to determine whether or not the dwellings comply with the basic performance measure of avoiding flows into a dwelling under the 100 year ARI – stating that gutters tend to overflow at low points thereby reducing the load on the downpipe system and that some gutters distort under full load and the distortion permits a discharge of water reducing the peak load. The audit report also found that AS3500.3 provides more rather than less downpipes and guttering than the BCA’s own “Acceptable Construction Practice” for the 20 year ARI. It would seem that the latter, in general, provides a more lenient basis for meeting BCA performance requirements.

As a result of the above findings, there is a concern by the Committee of a lack of adherence and understanding in industry concerning the use of *Deemed to Satisfy* solutions and the calculation methods involved in specifying the gutter size and number of downpipes to suit the roof area for a given 20 year ARI. Though evidence here is limited, there is concern about a lack of downpipes to deal with the ARI. Whilst such problems effect the compliance of all guttering systems trying to meet *Deemed to Satisfy* compliance, it is clear that *high fronted guttering* are more sensitive to the effects of such problems due to the ramifications that a lack of downpipe drainage has on overflow entry into a building. Informal overflow mechanisms – mentioned previously - may to an unknown extent assist in mitigating the chances of such overflow.

The Insurance Council of Australia(ICA)

The ICA formally advised the Committee that there was no systemic problem their members were able to identify in relation to *high fronted guttering*.

Industry Parties

Individual manufacturers, the Housing Industry Association (HIA) and the Australian Steel Institute provided advice to the Committee that they still had (following on from meetings held in 2008) no evidence of a systemic problem concerning *high fronted guttering* in NSW, or elsewhere in Australia.

The Committee was satisfied that a relatively small number of manufacturers dominated the guttering market – each made individual representations to the Committee. A number of them provided sales data to demonstrate that the vast majority of their sales involve *high fronted guttering* i.e. high fronted gutters represent between 65-86% of the overall eaves gutter market. Evidence was also presented by one manufacturer (by way of a historically significant advertising brochure) that *high fronted guttering* have been in the market place some 40 years, since 1970. The

collective point of the manufacturers was that with such a dominance of *high fronted guttering* in the market place, one would expect a much higher presence of complaints if it was a “systemic problem”.

In terms of explaining the finer points of *high fronted gutter* operation, most of the manufacturers drew attention to a number of informal overflow mechanisms which potentially worked to their advantage in appropriately managing overflow i.e. in high rainfall intensity events guttering can bend forward under the load of a full gutter of water and create a gap between the fascia and back of the guttering allowing water to overflow through the gap between the fascia and the back of the gutter. With some *high fronted gutter* designs (depending on how high the front of the gutter is) the bending forward also allows water to flow over the high front. One manufacturer tabled a report from a university research centre that validated these phenomena (discussed in more detail under Section 10).

In addition to the above, each manufacturer provided technical gutter data and it was apparent from this that some manufacturer’s products differed in design from others in things like cross sectional gutter area, the size of slots and the specific system for attaching the gutter to the fascia. Different brackets were also commonly used in replacement work compared to new work. In such cases, the gutter was often attached below the top of the existing timber fascia, thus reducing the likelihood of overflow into the building and thus differentiating such situations from concerns about metal fascia fixing methods. From these points, it was apparent that certain systems and installation situations had potential to perform better than others with regard to overflow management and in such instances it seemed difficult to lump the performance of all *high fronted guttering* in the same category.

The Master Plumbers Association advised that they believed problems still existed concerning *high fronted guttering*, but provided no quantitative or significant evidence of the extent of failure. They advised that the only appropriate measure for dealing with overflow from *high fronted guttering* and preventing water ingress into buildings was the inclusion of a specific type of continuous overflow measure - they provided a diagram of a flashing feeding into back of the gutter, to be used in conjunction with an anti-ponding board (similar to the one shown in AS3500.3/3500.5). With regard to this, the Committee does not support a single solution because this is contrary to the performance based approach of the BCA.

Anecdotal Reports of Overflow Problems

Some submissions referred the Committee to newspaper reports of individual cases of overflow problems with *high fronted guttering*. While the Committee found such information useful in understanding the context of individual cases and to some extent the historical background concerning *high fronted guttering*, the Committee does not consider isolated coverage of individual cases in the press to represent a sufficiently substantial database of evidence of a “systemic problem” with *high fronted guttering*. It is also noteworthy that some articles appear to be based on “here say”, loose speculation or a limited number of cases and yet try to create a momentum about the scale of the problem, based on an apparent absence of strong objective evidence. The Committee’s attention was also drawn to State Emergency Services publications advising the community of the need to maintain guttering to prevent overflow during heavy rain periods as an indication of a “systemic problem”. Such publications provide general information to members of

the public about risk mitigation strategies and do not in the Committee's view represent evidence of a "systemic problem" of *high fronted guttering*.

Conclusions About The Presence or Absence of Systemic Failure in *High fronted guttering*

Given the previous sources of data and the performance based definition used for assessing the situation, the Committee did not find sufficient evidence to say a systemic performance problem exists concerning *high fronted guttering*. There is however limited data from *Operation Flow* which suggests downpipes in particular may be on occasion underdesigned and this could increase the ramifications on overflow on *high fronted guttering* relative to low front gutters. There is also a general concern about the lack of ability to quantifiably manage overflow in preventing it from entering into a dwelling. In qualifying these statements, it is important to point out that:

- Some failures may go unrealised and therefore have not at this point in time been reported as a source that the Committee had access to;
- If failures occur, the main concern is overflow into the building as per the BCA's 100 year ARI performance requirement. Such events occur very infrequently and so a given dwelling may be yet to experience such as event. In addition, such occasional entry of water could conceivably go undetected and therefore data in such instances was not available for the Committee to consider. In such instances, the impact of irregular overflow occurrences on the building is currently unclear but deliberations on such issues should be made with the irregularity of such events in mind, plus the understanding that the intensity of such events usually only last for limited periods of time (usually minutes not hours). Further, cavity construction, flashings and features such as sarking over timber framework provide inbuilt safeguards to prevent moisture penetration to the structure and internal linings.
- That informal or previously unquantified forms of overflow – as discussed previously - may take a mediating role in assisting guttering installations to prevent water entry into buildings that would have otherwise occurred (refer Section 10 for further discussion on this issue);
- Most documented failures are not sufficiently described to determine if the problem is a non-compliance of gutters in general – such as a lack of cross sectional gutter area or lack of downpipes - or if the problem is specific to *high fronted guttering*. Notwithstanding this, it is apparent that under-design of things like cross sectional gutter area and number of downpipes will most likely have a more adverse impact on *high fronted guttering* than low front gutters because of the greater sensitivity to overflow issues.

In further considering the above conclusions, discussion is necessary on the *Deemed to Satisfy* design requirements for *high fronted guttering*, as discussed under the following headings

8 Issues Concerning "Acceptable Construction Practice" in the BCA

As stated previously, "Acceptable Construction Practice" (Section 3 of the BCA) provides the BCA's own *Deemed to Satisfy* means for complying with performance requirements. It was found by the Committee that in the past, reference to the management of overflow in "Acceptable Construction Practice" may have caused a degree of confusion and to some extent even lead to potential

problems with *high fronted guttering* meeting performance requirements, because of the way slotted gutters had been specified as an overflow measure.

Drawing on public records from the Australian Building Codes Board, slotted gutters were for many years the sole means mentioned for overflow in “Acceptable Construction Practice” and this was most evident under Amendment 2, in the 1998 version of the BCA. This remained the case up until the 2009 edition of the BCA when reference to slotted gutters was eventually removed.

Of note, the singular inclusion of this method during this period has been seen by the Committee as sending a message to industry that slotted gutters were adequate on their own, without consideration of other or additional overflow measures i.e. additional measures that may be necessary in meeting the previously discussed performance requirement about not allowing water entry into the building based on a 100 year ARI. At the core of this problem was the fact that slots were specified in vague terms and did not include attention to size, spacing and location of slots; or the difference in measurable overflow performance that each provides. For instance it is evident that some *high fronted guttering* have significantly different slot sizes to others, thus making it misleading to lump all of them together – especially given different ARI values across the State. Though some may argue that “Acceptable Construction Practice” provides a degree of direction on this issue – for instance, the “Explanatory information” at the end of Clause 3.5.2 which states that “...in heavy down pours a slotted gutter may be inadequate” - it is notable that this text is for guidance only (refer BCA Clause 1.1.8), hence reducing its impact and weighting of attention.

As a result, it can conceivably be concluded that those using slotted gutters under “Acceptable Construction Practice” between 1998 to 2009 could argue that they met the BCA’s performance requirements by virtue of meeting it’s own *Deemed to Satisfy* requirements, albeit that it is unclear if such measures (slotted gutters alone) meet BCA performance requirements– especially the need to prevent water entering the building based on the 100 year ARI.

On a more general note, it was apparent to the committee that many people using the BCA have a limited understanding of how information is structured in it. For instance people regularly made general reference to work being “BCA compliant” and though there is nothing in essence wrong with this, it was at times apparent that such people were not aware of the difference between the BCA’s performance requirements as opposed to “Acceptable Construction Practice” (which is purely one option for *Deemed to Satisfy* construction). This has at times reduced the tenor of the debate and thus the ability to resolve issues pertaining to *high fronted guttering*.

Of additional note, there is now virtually no guidance on appropriate overflow management for gutters in “Acceptable Construction Practice” albeit that this is important to the ability of *high fronted guttering* in meeting BCA performance requirements. It would be best to address this issue by introducing a more measurable and purposeful approach to overflow management in “Acceptable Construction Practice”.

9 Issues Concerning AS3500.3 and 3500.5

AS3500.3 and 3500.5 were the main options quoted by industry stakeholders used to comply with the BCA’s performance requirements. Whilst both documents provide well defined calculation procedures to determine roof catchment area, cross sectional area of eaves gutter, number of

downpipes and downpipe location requirements, both documents are far more subjective and imprecise in terms of specifying gutter overflow requirements. As with “Acceptable Construction Practice”, this is thought to be a short coming of the Standard because a more measurable approach to overflow management is important to *high fronted guttering*. This lack of fit between the Standard and the design needs of *high fronted guttering* was surprising to the Committee given that *high fronted guttering* hold such a large proportion of the market place.

In developing the discussion further, both AS3500.3 and 3500.5 specify eaves gutter to be designed for a 20 year ARI but are relatively silent on the amount of overflow to be matched with these gutters. For instance, the BCA performance requirements express that a 100 year ARI must not enter the building and when applied to *high fronted guttering* this means that a 20 year ARI gutter would need to be supplemented with overflow management satisfying the 100 year ARI no entry into the building requirement. This is not dealt with in AS3500.3/3500.5 and subsequently, there are no quantifiable criteria for overflow in these Standards. This creates unwanted subjectivity– a view which was confirmed by the majority of those who presented to the Committee.

This lack of clarity and connection with the BCA performance requirements is further accentuated when checking the definition of overflow in AS3500.5 which states that an overflow device is to “... safely divert flow in the event of a blockage”. This tends to address the efficient function of the gutter (i.e. designed for a 20 year ARI) but does not deal with the case for *high fronted guttering* and the abovementioned requirement of preventing 100 year ARI water entry into the building.

At a more general level, there was significant debate from people presenting to the Committee concerning details in AS3500.3/3500.5. Based on specific excerpts from AS3500.3/3500.5 they would often assert a position about the suitability or otherwise of *high fronted guttering* in meeting “mandatory” BCA performance requirements. In many instances, such assertions were made incorrectly, either because:

- AS3500.3/3500.5 represents only one way of meeting the BCA’s performance requirements and therefore it is not mandatory in meeting performance requirements
- In many instances people seemingly misunderstood the levels of information in AS3500.3/3500.5. They did not realise that Standards are written with two levels of information: “normative” and “informative”. Within the context of the Standard, “normative” carries “must do” status whilst “informative” is for guidance only. People often wrongly used “informative” information as if it was “normative” (must do). Examples of such instances include incorrect use of information in Appendices, “Notes” and “Examples”. To demonstrate this point and to clarify various areas of debate, instances include:
 - **Example 1:** the need for continuous overflow was regularly asserted as being mandatory for gutter installations but of note, this requirement is not called up in the BCA performance requirements and is only in the “informative” part of AS3500.3. In this capacity, Appendix G allows users the choice between “continuous overflow”, or a “specifically located overflow” and as such there is a choice rather than a “must do” requirement.
 - **Example 2:** It was asserted that terms used in AS3500.3/3500.5, such as “obstruction” and “blockage” should encompass the likes of leaves, vegetation, dead animals and

other such blockages that may occur over the operational life of the gutter. As a result, it was asserted by certain people presenting to the Committee that gutters should be designed with contingency for such events. Again, this assumption is wrong in meeting mandatory BCA performance requirements because the Code is silent on all durability issues including gutter maintenance. Such comments also seem ill founded because “notes” in the Standards (such as clauses 5.5.1 and 5.5.14 of AS3500.5) clearly state that the expectation is for regular maintenance and cleaning of gutters and that is the reason why such blockages are not accounted for in the stated design criteria. Even the instance concerning hail blockage (which is contained a normative section of the Standard) mentions that this only need be taken into account where hail occurs “frequently”.

- **Example 3:** Six examples of provision for gutter overflow are provided in both AS3500.3 and 3500.5. Of note, the location of this information varies in the two documents: one has it located in the Appendices and the other as “examples” within the normative section of the Standard. Standards Australia advised the Committee that in both instances, the information should be treated as “informative” only. In this context, these examples were often wrongly asserted by those presenting to the Committee as being the only mandatory means of providing gutter overflow compliance. This is incorrect as these examples should not be seen as being exclusive of other options – they are examples only. This situation also causes problems because most of the six examples do not appear to be regularly used by industry and most are not especially suited to contemporary *high fronted gutter* design. It was considered strange by the Committee that AS3500.3/3500.5 did not cater more for *high fronted guttering* given that this type of gutter is the most common in the market place. To some extent the above problem was found to be compounded by the fact that the same six examples have regularly been republished in brochures and circulars by other organisations, thus adding to the wrong perceptions mentioned above (refer Section 13 for details on this issue).

10 Less Common Insights into Overflow Management – Where Does the Water Go?

In deliberating on the previous commentary it was apparent to the Committee that a more measured an analytical approach to overflow (than in the current *Deemed to Satisfy* options) is desirable for ensuring the performance of *high fronted guttering*. As mentioned previously, this view was supported by the majority of those presenting to the committee including the gutter manufacturers themselves. To this end, it is worth structuring and to some extent cataloguing the various tested and informal measures of capacity and overflow relating to *high fronted guttering*:

- In terms of gutter capacity, a senior technical hydraulic specialist within the NSW Government Architect’s office made comment that gutter sizes in AS3500.3/3500.5 are conservative in sizing and that a more refined approach is available in the CSIRO’s 1973 publication “Roof Drainage”, as authored by K.G. Martin. This point is supported by a hydraulic engineer specialising in roof drainage calculation who maintains a dedicated web site (<http://www.roof-gutter-design.com.au/>). He provides interesting information on gutter and downpipe “theory” where he states that “AS3500 does not take into account the

location of the downpipe along the gutter, nor does it adjust the formula for bends in the gutter. This can make a big difference. The code only allows for the worst possible case. This makes it ideal for residential buildings with many turns and bends in the roof. However for projects with long straight roofs (large industrial sheds) it would be conservative (ie an overdesign). For these projects, the CSIRO have produced formulas that take into account the location of down pipes and bends along the gutter.” He also adds with applicable relevance to *high fronted guttering* that “the greater the depth of water over the down pipe (which would potentially be greater for a *high fronted gutter* than a low front gutter) the more water can be forced through this entry orifice.” These comments perhaps go some way to explaining a degree of tolerance in AS3500.5/3500.5 based designs that escape recognition but may serve to help explain why there is not more evidence of overflow problems in *high fronted guttering* situations.

- There was general support that the calculations reported by Dr. Manning quantifying overflow drainage from gutter slots was reasonably accurate. Further checking by a senior technical hydraulic specialist within the NSW Government Architect’s Office provided similar conclusions. Separate to this, the Committee has no comment on the debate in Dr Manning’s report comparing the difference between slots and a 10mm gap between the fascia and gutter. Instead, the Committee advocates an approach based on choosing one or more overflow measures selected to prevent the 100 year ARI from entering the building, rather than backing a single option.
- One of the gutter manufacturers provided a detailed laboratory test report undertaken by a University based water research laboratory. The work indicates that for the tested gutter a considerable amount of water systematically drains down between the fascia and gutter – hence preventing the potential for overflow into the building. The gap is an average 2mm wide but the actual width varies considerably in range. The report states that the gap was up to 10mm wide mid way between gutter support clips. This occurs as the gutter deflects forward under water load and the water in the gap acts as a head that pushes the water through. Video footage was also provided concerning this phenomenon.
- It is also apparent that part of the stated problem with *high fronted guttering* is that the back of the gutter and the top of the fascia are at the same level thus creating a weakness for back-flooding into the dwelling. As alluded to previously, not all *high fronted guttering* take this approach and in such instances the back of the gutter may be significantly below the top of the fascia. Further, most *high fronted guttering* is constructed to a 1:500 (min) fall and though the gutter may begin in-line with the top of the fascia, it then tapers below it as the fall takes effect, thus creating freeboard and subsequently increasing the potential for outward rather than inward overflow (e.g. 1:500 fall in gutter over 10m gutter length provides up to a 20mm drop in the gutter line). This may especially happen at the stop end of the gutter.
- An alternative design approach that was mentioned by a number of people presenting to the Committee related to increasing the size of gutters and downpipes to deal with the 100 year ARI (instead of the 20 year ARI called for in the *Deemed to Satisfy* options) and as result, avoid the likelihood of overflow from occurring.
- Similar to the previous point, it was mentioned that in some instances – mainly locations where 20 year ARIs are relatively low – designers may select an incremental gutter size from a manufacturer which is larger than needed due to the lack of ideal sizing availability, thus

dealing with a portion of the 100 year ARI that would normally need to be dealt with via overflow provisions

To collectively model the above issues, a diagram is shown in Figure 2. It aims to simply structure understanding concerning the areas of overflow management relevant to *high fronted guttering*. By viewing these components in measurable overflow terms, it should be possible to more easily and reliably prove compliance of *high fronted guttering* in meeting BCA performance requirements.

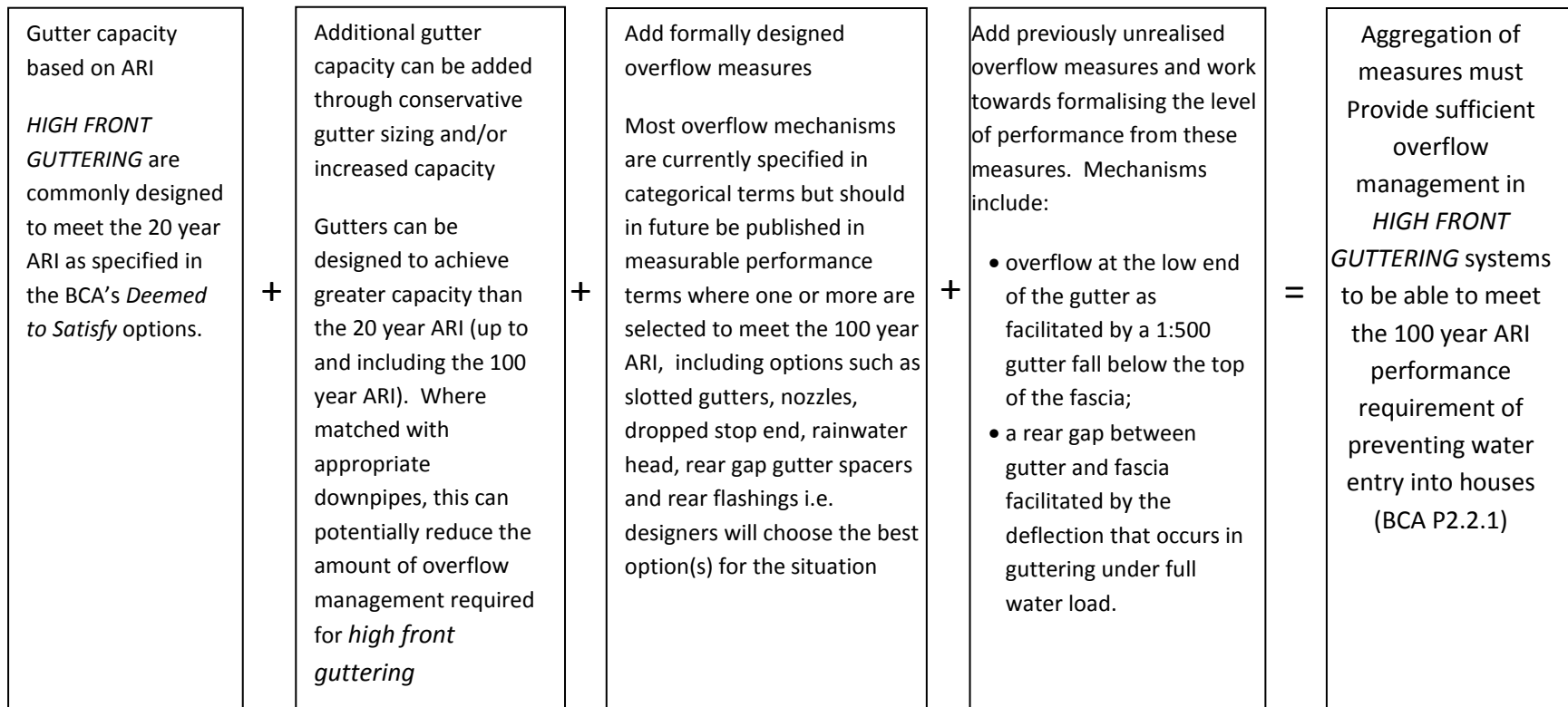


Figure 1: Combined overflow management in meeting the BCA's 100 year ARI performance requirement

11 A Gap in Responsibility for Design and Installation Compliance

It was realised by the Committee that for *high fronted guttering* to be reliably designed and installed in accordance with BCA performance requirements, there is a need for commitment throughout the supply chain - participants involved in this included gutter manufacturers, architects, building contractors and subcontract installers.

Manufacturers of guttering systems generally believe that they provide a kit of parts capable of meeting BCA performance requirements, but add that specific combinations of parts involve site specific application and in their view responsibility for the design and installation of *high fronted guttering* systems therefore rests with the architect, builder and installer, respectively. It was apparent that at times there was a gap in this supply chain where responsibility was divested down the line to eventually rest with the last link in the chain - the installers. An example posed often to the Committee was where an architect had only shown downpipes as a nominal inclusion on the plans located to primarily suit aesthetic needs and the ensuing problem was then largely unattended until reaching the installer who would be left with the problem of designing the gutter and downpipe system – albeit that they were not necessarily in full control of the variables required to fully address the problem.

Feedback from those presenting to the Committee suggests that only few in the supply chain take a strong role in designing according to the calculation intensive method described in AS3500 for gutter and downpipe sizes. It seems that few understand this approach in sufficient detail and though it appears to be underpinned by good science, there is an overly high likelihood that muddled guesswork rather than reasoned action may unfortunately prevail.

Installers interviewed by the Committee and operating in the replacement gutter market were faced with different problems to new work situations - they must fit in with the constraints of the existing building. They advised of various installation measures they adopt to ensure compliance in different replacement situations including providing an appropriate slope in the guttering system to aid water flow towards downpipes, installation of additional downpipes, installation of inverted nozzles, spitters and rain water heads to meet overflow situations, and ensuring that the rear top of the gutter sits below the top of the fascia board.

While all parties acknowledged that the builder is ultimately responsible for ensuring compliance with the BCA and AS3500, significant doubts were raised by a number of parties including councils and industry associations about the effectiveness of current building certification requirements and practices for ensuring that the design and installation of *high fronted guttering* actually meets the code and standards. This is because the installation of guttering is not included in the mandatory certification stages on individual projects and also is not routinely checked because of alleged difficulties and the cost of roof inspections. The Committee notes that some councils have introduced certification requirements for guttering similar to those for fire alarms and bushfire prevention measures.

The committee supports the incorporation of measures for the certification of the design and installation of guttering in building approval and certification processes as a means of clarifying and

strengthening the roles and responsibilities of designers, builders and certifiers as an integrated supply chain that is better positioned to ensure the quality of compliance outcomes.

12 Product Development to Improve Overflow Management

In presenting to the Committee it was apparent that all of the leading gutter manufacturers had either developed or were in the process of developing new fitments to assist with overflow management. Most of the new fitments could be used as an additional measure to slotted gutters. Most provided continuous overflow including gap spacers between the gutter and fascia.

Though the Committee felt such product development was a step in the right direction, only few had done sufficient research to be able to quantifiably measure the overflow performance of such fitments and until this level of knowledge is reached, such fitments cannot be used with the level of accuracy required to reliably address their contribution to preventing water entry based on the 100 year ARI.

The committee also had a general concern that for these new fitments to be successful, they require manufacturers to champion and promote the need for their usage, otherwise the existing ad hoc approach will continue to prevail.

13 Sources of Information Causing Confusion About *High fronted guttering* Requirements

In response to media and political concerns about the alleged problems of *high fronted guttering* in meeting BCA requirements, a number of organisations including NSW Fair Trading, Planning NSW, councils, industry associations and manufacturers have in the last two years produced their own brochures and circulars attempting to clarify the requirements and provide examples of guttering designs and installation methods that would meet BCA requirements. While well intentioned, such documents have compounded confusion around the issue as some contain incorrect information or are incomplete in relation to the context and the need to consider all relevant factors such as the area and pitch of the roof, relevant ARI data, the number and size of downpipes, the type of guttering and fascia, the gap if any between the gutter and fascia, the eaves if any, and whether flashing or additional devices are to be installed. Also some brochures include diagrams and examples of various solutions for dealing with overflow that are not commonly used in industry or have limited relevance to *high fronted guttering*. As discussed previously under Section 9, this includes re-publishing examples from AS3500.3/3500.5 and this information has been potentially taken as mandatory when its context in the Standard is only at an “informative level”.

A further example is in Planning Circular BS 09-006 where there is confusion in meaning caused by Planning NSW’s comment that overflow measures in the BCA’s “Acceptable Construction Practice” (Clause 3.5.2.5) should be consistent with AS3500.3 Appendix G. This potentially causes practitioners and certifiers to think that only AS3500 exists as an option in meeting Clause 3.5.2.5. This is incorrect and appears to be an interpreted view made by Planning NSW and not a view expressed in the BCA. For instance, Clause 3.5.2.5 and AS3500.3 represent different pathways of meeting “*Deemed to Satisfy*” requirements in the BCA. Given this, the circular should not suggest an exclusive link in construction requirements between the two documents because no such link exists.

A similar confusion is found in the Australian Steel Institute's information sheet in wrongly linking BCA "Acceptable Construction Practice" 2009 requirements for overflow measures with the need to meet AS/NZS 3500.3.2003 requirements in Appendix G. As stated in the previous paragraph, any implied exclusivity in this linkage is incorrect.

Information on NSW Fair Trading's website on residential gutters also creates confusion as it implies that compliance with the NSW Code of Practice for Plumbing and Drainage, which requires that all guttering be designed and installed in accordance with Australian/New Zealand Standard 3500.3 sections 3,4 and part 5, will meet the relevant requirements of the BCA. As discussed above, AS3500.3 represents one way of meeting *Deemed to Satisfy* requirements in the BCA. Further, as discussed earlier in this report and as advised by NSW Fair Trading, compliance with the NSW Code of Practice for Plumbing and Drainage is more relevant to the regulatory framework for plumbing work that is regulated by water authorities and local councils, than to roof plumbing that is regarded as building and construction work and regulated under the BCA and Home Building Act 1989.

As an over-arching comment concerning most of the above instances, there is a common trend to quote "informative" level information from AS3500 and as previously stated in this document, this level of information is for guidance rather than carrying the importance of "must do" status (i.e. "normative" level information). As a result, a number of the above mentioned publications are in the committee's view inadvertently misleading practitioners. The information is also not well oriented to addressing the performance needs of *high fronted guttering* and this is disappointing given that these publications were apparently developed in order to address concerns about *high fronted guttering*.

14 The Re-guttering Market

This market is large - stakeholders suggest it represents between 65-86% of all guttering sales. Though such figures have not been validated by reliable sources of data, such claims hold validity on the basis that the vast majority of the overall building stock is made up of existing buildings. Accompanying this, gutters seldom last the full life of a building, hence replacement is somewhat inevitable. For instance the Cooperative Research Centre for Construction Innovation indicates that for many environmental categories, guttering is replaced at between 10-30 year periods (Predicted lifetimes of metallic building components, viewed on 1/2/11 at <http://www.construction-innovation.info/>) and when extrapolated across the total housing stock of Australia, it is clear that the market is potentially much larger than the new dwelling market.

An important issue here is that older buildings are quite likely to have been constructed from low front gutters that automatically provide for overflow that is directed away from entering the building. If such gutters are replaced with *high fronted guttering* then alternative overflow provisions may be required to prevent the 100 year ARI from entering the building. There is sufficient anecdotal evidence to have concern that in future, replacement guttering should not leave the building worse off in its ability to prevent water entry into the building than the old guttering system – it should meet current BCA performance requirements (advice from Planning NSW indicates that such guttering represents new work under the EP&A Regulation 2000 which calls up the BCA as the regulatory document to be followed for gutter design and construction).

15 Training, Licensing and Associated Problems

Over an extended period the plumbing trade (including roof plumbing) has fragmented into individual areas of specialisation as driven by productivity improvement and labour installation costs. This has impacted on guttering, fascia and downpipe installation which has collectively become grouped under a specialised work package common in the housing industry. As discussed in Section 4 of this report the installation of guttering, or roof plumbing work is regulated by NSW Fair Trading as 'residential building work' under the Home Building Act 1989. This license therefore allows traditional plumbers (which are typically licensed under a broader gamut of plumbing skills including drinking water supply in premises, sanitary drainage systems, and garden reticulation systems) to do this type of work, but also allows non-plumbers to also do roof plumbing work.

Consistent with the above, there is a special licence for roof plumbing that can be attained by traditional plumbers who have undertaken Plumbing Certificate III, as long as they have also included taking the roofing stream. Non-plumbers must complete the freestanding Certificate III in Roof Plumbing through TAFE or a registered training organisation.

Roof plumbing (including guttering) is covered by the protection of the Home Building Act 1989, including that it be performed by an appropriately licensed person with expertise in roof plumbing, and that it complies with the BCA. NSW Fair Trading licences persons to undertake roof plumbing in accordance with the Home Building Regulation 2004. Clause 10 of the Home Building Regulation 2004 provides that any work involved in the fixing, installation, renovation, alteration, repair and maintenance of guttering, downpipes and roof flashing, as well as roof, wall and ceiling coverings on any building or structure (other than a non-habitable farm building) is declared to be roof plumbing work for the purposes of the *Home Building Act 1989*, except work in relation to certain types of roof coverings such as glass, concrete, timber, thatching or bituminous material.

Given the above discussion it is worth clarifying that the Sydney Water and Hunter Water Corporations, local councils and other plumbing regulators do not regulate roof plumbing. The terms of the relevant legislation including the various definitions of plumbing and drainage work differ across legislative instruments and may cause confusion. Indeed, there is considerable regulatory reform in this context and in response to a recommendation of the Independent Pricing and Regulatory Tribunal in October 2006 for an in-depth review of the plumbing regulatory framework as a priority, the NSW Government has prepared a package of reforms to streamline the system and apply consistent standards for work across the State. As part of these reforms, NSW Fair Trading will become the single regulator of on-site plumbing and drainage work in the State. In addition it is proposed to replace the NSW Code of Practice with the Plumbing Code of Australia as the technical standard for plumbing and drainage work in New South Wales. A bill giving effect to the reforms – the Plumbing Bill 2010 - was passed by the Legislative Assembly on 25 November 2010 and introduced to the Legislative Council on 30 November 2010. However, the Bill did not proceed to debate before Parliament rose for the year and will need to be re-introduced after the NSW State election.

The reforms however, will not affect the regulation of roof plumbing in practice which will continue to be regulated as building work under the Home Building Act 1989. However, if NSW adopts the anticipated National Construction Code (NCC) which will see the merger of the BCA and the

Plumbing Code of Australia into a single Code guiding building construction across Australia, there will be some linkage between the regulatory framework for plumbing and roof plumbing.

In adding to the dynamics of the above context, the Master Plumbers Association advocate the proposition that roof plumbers and plumbers should be included within the one occupational stream, plumbing and drainage, under the proposed National Occupational Licensing System (NOLS), being developed by the Council Of Australian Governments (COAG). However it is the view of the Committee that whilst plumbers should have easy licensing access to roof plumbing markets, it is largely a work package that is unattended by them – feedback from a number of sources presenting to the committee stated that there was an under supply of licensed people and this is because many licensees prefer to work in other areas of plumbing specialty which provide higher pay than gutter and downpipe installation. One large manufacturer drew attention to the inadequacy of specific training in guttering installation as part of the initial and ongoing licensing requirements for roof plumbers. The company noted that the current roof plumbing course in NSW includes only ten hours on guttering and drew attention to the introduction of a six month course in roof fascia and guttering in Queensland and the development of a 16 week course for gutter fascia installation in Western Australia as a joint initiative between government, industry and TAFE. The same company expressed concern that there appear to be too many unlicensed tradespersons installing guttering in the marketplace.

To address this, they have approached government institutions to fund such a course which would focus purely on fascia, gutter and downpipes. The problem with the current situation is that roof plumbers cover a broader scope of works than this, and as a result, many have found it more profitable to specialise in the area of sheet metal roofing installations and less profitable to specialise purely in fascia, gutter and downpipe installation. The abovementioned manufacturer therefore advocates shorter training and a more specialised licence purely for fascia, gutter and downpipe installation.

In adding to the above discussion, figures available from NSW Fair Trading show that in June 2009 there was a total of 17,233 licences for plumber and roof plumber, 304 for plumber, 1902 for roof plumber, 1634 for water plumber and 17,791 for drainer. Despite the majority of joint plumbing and roof plumbing licences, the committee was advised that it is likely that NOLS will maintain the current separation between roof plumbing within the building and construction stream and plumbing within the stream of plumbing and drainage. If this separation is maintained it is imperative that plumbing and roof plumbing licence holders receive up to date information with compliance requirements in relation to both roof plumbing and plumbing.

The Committee concurs with the importance of ensuring that quality, relevant, contemporary and cost effective training in guttering installation is readily available for persons preparing to meet initial licensing requirements in roof plumbing and as part of the continuous improvement requirements for ongoing licence holders. The Committee supports the development of joint initiatives between industry and training providers to provide such training and to meet current and future skills needs and that this should be coordinated with licensing requirements to ensure licensing requirements do not impede the supply of appropriately qualified trades people to the market. Calculations relating to the *Deemed to Satisfy* options discussed earlier in this report (including AS3500.3/3500.5) are not as simple as may be first thought, and there is concern that

there is insufficient knowledge in this area at trade level. Of note, this includes knowledge of the BCA performance requirements and the need arising from this report concerning a more measured approach to overflow management when using *high fronted guttering*.

16 NSW Fair Trading Complaint Handling

NSW Fair Trading has been in a difficult position in dealing with complaints about *high fronted guttering*. For instance, the BCA provides the basis for assessing whether or not work is defective, in accordance with the NSW Home Building Act 1989. Up until early 2009 the “Acceptable Construction Practice” section of the BCA extended legitimacy to slots as being a major, if not the sole, appropriate measure for dealing with overflow from *high fronted gutter* installations.

Following on from Ministerial and NSW Fair Trading interest in early 2008 in *high fronted guttering* and the adequacy of overflow measures that may accompany their installation, the BCA downgraded the status of slots as an adequate overflow measure.

Given the status afforded to slots within the BCA as an overflow measure, it has been difficult to take decisive corrective action against builders, roof plumbers and plumbers, so NSW Fair Trading has relied on mediation to resolve such complaints.

17 Conclusions and Recommendations Concerning High fronted guttering and Associated Overflow Measures

As an overriding conclusion, there is no evidence of a systemic problem concerning *high fronted guttering* given the sources of information available and presented to the Committee, and using BCA performance requirements as the basis for assessment.

In making these deliberations, it proved difficult to deal with *high fronted guttering* as one homogenous category as the likes of replacement gutters are often fixed differently to fascias compared to the combination guttering and metal fascia components commonly used in new home construction.

In terms of overflow management as required for *high fronted guttering*, there is to some extent a lack of fit between the performance requirements of the BCA and the *Deemed to Satisfy* options. Designers and installers have not necessarily been provided with appropriately predictable and objective methods for addressing overflow regarding *high fronted guttering*, thus proving compliance has not been easy to accurately address (especially the performance requirement that water should not enter the dwelling based on the 100 year ARI). There is also general concern by the Committee of an apparent lack of understanding and adherence in the industry concerning the use of *Deemed to Satisfy* solutions – mainly the calculation methods involved in specifying the gutter size and number of downpipes to suit the roof area for a given 20 year ARI. Though evidence here is limited (refer to Section 07.3 on Operation Flow), there is concern about a lack of downpipes. Whilst such problems affect the compliance of all guttering systems trying to meet *Deemed to Satisfy* compliance, it is clear that *high fronted guttering* is more sensitive to the effects of such problems due to the ramifications that a lack of downpipe drainage has on overflow entry into a building. To an unknown extent, informal overflow mechanisms that are not normally counted in overflow

management may assist in mitigating the chances of such overflow. Alternatively, there is the prospect that many houses have yet to be exposed to a 100 year ARI. More detailed conclusions follow:

Overflow

Conclusion: Overflow measures are important to the performance of *high fronted guttering* and should be seen as a responsive measure contained in *Deemed to Satisfy* solutions (and other Building Solutions) that meet the BCA performance requirements (e.g. no water entry to the building given a 100 year ARI). Current *Deemed to Satisfy* solutions do not currently deal with overflow adequately or objectively or in a way that is suited to *high fronted guttering*. Neither the BCA's *Acceptable Construction Practise* nor AS3500.3/3500.5 provides measurable requirements for overflow to be included in guttering, and this needs to be resolved. Responsibility for maintenance needs to be clarified as well. The Committee believes that the relevant building practitioners and licensed contractors cannot be held responsible for overflow events that are created through blockages caused by inadequate maintenance of guttering and downpipes. Those who wish to minimise maintenance, should specify higher level features in the design of guttering systems but this is considered to be above the minimum standards provided by the BCA's performance requirements.

Recommendations:

1. That consideration be given by the Australian Building Codes Board to ensure that all Building Solutions (especially *Deemed to Satisfy* solutions) that use *high fronted guttering* be designed to have the capacity to accommodate the building's location 100 year ARI.
2. That overflow requirements be stated in quantifiable and measurable terms in *Deemed to Satisfy* solutions, to prove that performance of one or more options will meet the 100 year ARI.
3. In conjunction with the previous recommendation, that the Australian Building Codes Board (including input from industry, government and consumers) give consideration to and debate different means of meeting the above overflow requirements – such as increasing the design capacity of *high fronted guttering* from the 20 year ARI to the 100 year ARI. This should include debate and consideration of the ramifications of continuous versus location specific overflow.
4. That, recognising the responsibility for the correct installation of guttering and downpipes under the Environment Planning and Assessment Act and the Home Building Act 1989 lies with building practitioners and licensed contractors, to assist, manufacturers should be required to test and publish design information including cross sectional gutter areas and overflow rates for their preferred overflow provisions e.g. set down below the top of the fascia clips, flashing, gutter slots, fascia-gutter spacers, inverted nozzles, rain water heads etc.

Slots

Conclusion: Slots for overflow represent one of the central issues pertaining to the performance of *high fronted guttering*. To date they have been inadequately specified in a general sense, providing no accountability to measurable performance. Past reference to slots as the only implied means of managing overflow in the “Acceptable Construction Practice” section of the BCA, has proven problematic and may have inadvertently advocated an insufficient option for meeting performance requirements.

Recommendations:

5. That consideration be given by the Australian Building Codes Board and Standards Australia to clarifying that slots in and of themselves are not necessarily a means of meeting BCA performance requirements.
6. That, like all other solutions and consistent with Recommendation 2 above, slots should be assessed in terms of meeting measurable overflow rates. This should include attention to the rate of overflow achieved for a given slot size, slot spacing and slot location.
7. That where measures indicate slots provide inadequate overflow rates, designers need to aggregate this option with others or simply use a better performing option to meet required overflow rate measures.

Consistency and Clarification of Standards

Conclusion: Inconsistencies between normative and informative information in AS3500.3/3500.5 need to be rationalised, as does the abovementioned lack of attention to overflow management as required for *high fronted guttering*.

Recommendation:

8. That Standards Australia and the Australian Building Codes Board review the need for greater consistency between AS3500.3 and 3500.5, especially with regard to overflow and its application to *high fronted guttering*.

Strengthened Certification Provisions

Conclusion: The NSW Environment Planning and Assessment Act requirements could be strengthened to ensure that evidence is provided at the Construction Certificate stage that all downpipe and gutter installations include design details (catchment area, cross sectional size of gutter, number of downpipes etc) in submitted plans that meet BCA performance requirements and, in particular, have adequate overflow measures to deal with the relevant 100 year ARI event.

Recommendation:

9. That NSW Fair Trading and Planning NSW jointly consider the most appropriate way to secure compliance with BCA performance requirements for the design and installation of gutters, downpipes and overflow measures (this could be done in conjunction with the

adequacy of rainwater retention systems), as a criteria for the issuing of Construction Certificates for all home building work in NSW that includes *high fronted gutters*.

Replacement Guttering

Conclusion: Under The NSW Environment Planning and Assessment Act all replacement guttering work in NSW currently has to comply with the BCA. Manufacturers and NSW licensed contractors (Builders, Roof Plumbers and Plumbers) need to be reminded of this requirement, including the requirements to ensure that downpipes, appropriate overflow and stormwater drainage capacity are adequately addressed in all replacement works.

Recommendation:

10. That NSW Fair Trading write to all relevant licence holders (Builders, Roof Plumbers and Plumbers) to remind them that all guttering replacement works they carry out have to comply with the BCA, including downpipe capacity and appropriate provision for overflow, and that all such works need to be carried out by appropriately licensed contractors.

Industry Skills, Education and Training

Conclusion: The Committee was advised on the roll-out of National Occupational Licensing Scheme (NOLS) over 2011 and 2012. The Committee was also informally alerted to a looming shortage of licensed roof plumbers in NSW. Care needs to be taken to ensure roof plumbing remains a part of building regulation and licensing in NSW under NOLS and that there is an adequate supply of qualified new entrants into the industry, in addition to new entrants through plumbers' training programs. Attention also needs to be paid to ensuring that all relevant licence holders are kept up to date with prevailing BCA performance requirements.

Recommendations:

11. That NSW Fair Trading, NSW TAFE, manufacturers and industry bodies assess whether or not there is a prospective shortfall in labour supply, and develop and implement training programs to ensure the supply of licensed contractors. Such training should include a full understanding of the BCA performance requirements, how building solutions (especially *Deemed to Satisfy* solutions) serve to meet these requirements and how to calculate *Deemed to Satisfy* gutter, downpipe and overflow requirements.
12. That NSW Fair Trading, NSW TAFE, manufacturers and industry bodies also develop appropriate training programs for existing licence holders including top up training to meet any perceived knowledge gap and continuous education and training programs.
13. That NSW Fair Trading undertake an audit of the extent to which installers hold appropriate licences, and take appropriate enforcement action on unlicensed installers.
14. That NSW Fair Trading take on the role of issuing direct advice to all relevant licence holders of changes made to the BCA (and National Construction Code in the near future) and

AS3500 that have a bearing on the installation of gutters and downpipes, and that contract holders be required to acknowledge that they have received such direct advice as part of maintaining their status as a licensed contactor in NSW.

Appendix A – Original terms of reference as per the Ministerial appointment of the Committee.

REVIEW OF THE USE AND INSTALLATION OF *HIGH FRONTED GUTTERING* IN NEW SOUTH WALES

1 Background

- 1.1 *High fronted guttering* systems have been supplied and fitted across Australia for almost 20 years. The Building Code of Australia (BCA) and, more specifically, the Australian Standard (AS3500) provides guidance to builders and roof plumbers on the appropriate methods for installing guttering. The principal performance standard set by the code and standard is that guttering is to be installed using methods designed to ensure water overflow from gutters does not enter a building.
- 1.2 In 2008, claims were made that installation methods for *high fronted guttering* did not meet Building Code of Australia requirements.
- 1.3 Concerns had been raised about the use of slots in the guttering as an overflow provision. Slots in *high fronted guttering* is only one of a range of methods provided for in the BCA and AS3500. The overflow system must be designed and installed in compliance with the relevant codes and in a manner which is appropriate for the area's typical rainfall patterns.
- 1.4 As a result of the claims made in 2008, NSW Fair Trading convened a forum with all major industry stakeholders, insurers, manufacturers and government agencies. The forum concluded that there was no evidence to hand to suggest that *high fronted guttering* was a systemic issue in NSW.
- 1.5 Notwithstanding, the forum did conclude that an amendment to the Building Code of Australia (BCA) was required to remove a direct reference to "slotted guttering". The forum was of the view that direct reference to slotted guttering in the BCA may mislead builders, roof plumbers and installers into believing that slotted gutters, on its own, would satisfy the requirements of the Australian Standard (AS3500).
- 1.6 In addition to holding the forum NSW Fair Trading implemented the following measures:
 - in conjunction with the Master Plumbers Association of NSW produced a circular to remind installers about the codes and standard for installing gutters;
 - placed installation guidelines with diagrams on its website (Tab A1);
 - write to over 150 councils across NSW to remind them of the need for council certifiers to check guttering against the codes and standards;
 - had the Building Professionals Board (Department of Planning) issue a circular to all private circulars on this issue (Tab B1);
 - invited councils to forward the details of any cases where it was believed that property damage has occurred due to inadequate gutters;
 - consulted with builders and tradespeople at trade seminars during 2008-2009;
 - discussed the issue with regulators from States and Territories.

- 1.7 The consultation outlined above did not uncover any evidence to suggest that the installation of *high fronted guttering* was a significant problem in either NSW or elsewhere in Australia.
- 1.8 During the second half of 2009 Fair Trading conducted an online survey of traders and homeowners to seek evidence of any widespread problem. The survey closed at the end of January 2010. Because of the very small number of respondents, the results were inconclusive.
- 1.9 Nevertheless, the survey responses from builders and plumbers indicated that some designers of guttering may not be applying the Building Code of Australia requirements. In light of this, Fair Trading has inspected guttering on builders' display project homes across NSW to ensure that the people designing *high fronted guttering* systems are complying with AS3500.
- 1.10 The inspections of display homes to-date has indicated that the guttering design for a high number of display homes is not compliant. Fair Trading has written to the major builders involved seeking their comments.

2 Scope of the Review

- 2.1 The review panel is to conduct a review of concerns that *high fronted guttering* installed to residential homes in New South Wales is defective and that evidence exists that there is a systemic problem with the installation of *high fronted guttering*.

3 Review process

- 3.1 In undertaking the review the panel, amongst other things, is to examine all evidence collected by the Department of Services, Technology and Administration (NSW Fair Trading).
- 3.2 Conduct meetings with relevant government agencies, manufacturers, installers and industry stakeholders.
- 3.4 The Review panel is to report back to the Director-General, Department of Services, Technology and Administration.

4 Departmental Contact

Mr Michael Cooper
Acting Assistant Commissioner
Home Building Service.
Level 4, Enterprise House
PARRAMATTA 2150
Ph: (02) 9895-9900 Mb: 0427 603 291

Appendix B – References

Submissions to the Committee were received from:

Councils:

- City of Canterbury
- City of Sydney
- Dubbo City Council
- Eurobodalla Shire Council
- Hurstville City Council
- Penrith City Council
- Port Macquarie Hastings Council
- Strathfield Council
- Warringah Council

Other:

- Haley Somerset Ventris Pty Ltd (chartered quantity surveyors)
- Insurance Council of Australia
- Stratco (Australia) Pty Ltd (a guttering manufacturer)

The Committee had communication, including meetings and written submissions, with a number of individuals and organisations in the course of researching the issue

Individuals:

- Mr Ian Higgins
- Dr Shaun Manning, Newcastle University
- Dr John Kaye MLC

Companies and Industry Associations:

- Ace Gutters Pty Ltd
- Archicentre
- Australian Continuous Gutter Services
- Australian Institute of Architects
- Australian Institute of Building Surveyors
- Australian Steel Institute
- Bluescope Lysaght
- CJM Roof Services and Reward Homes
- Housing Industry Association
- Metroll Pty Ltd
- Master Plumbers Association
- Stramit Building Products

Government and Regulatory bodies:

- Australian Building Codes Board
- Building Professionals Board
- Department of Planning
- Department of Services, Technology and Administration
 - Director-General, Deputy Commissioner Fair Trading Operations, and Deputy Commissioner Fair Trading National Reform Agenda
 - Government Architect's Office, NSW Public Works
 - Home Building Service, Fair Trading National Reform Agenda, and Fair Trading Policy, NSW Fair Trading
- Standards Australia

Appendix C – NSW Fair Trading opinion on regulatory status of BCA and NSW Code of Practice for Plumbing and Drainage



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Ref: M10/5214

Dr Perry Forsythe
Chair, High Front Guttering Advisory Committee
c/- Ms Jenefer Plummer
Home Building Service
NSW Fair Trading
PO Box 972
PARRAMATTA NSW 2124

Dear Dr Forsythe

I write in response to your request for advice about the respective roles and regulatory status of the Building Code of Australia (BCA) and the NSW Code of Practice for Plumbing and Drainage in relation to guttering work (also referred to as 'roof plumbing').

In short, clause 98(1)(a) of the Environmental Planning and Assessment Regulation 2000 states that all building work carried out under a development consent must be carried out in accordance with the Building Code of Australia. Accordingly, NSW Fair Trading uses the BCA as the framework for assessing the installation of high front gutters. This is because the installation of guttering, or roof plumbing work, is regulated by NSW Fair Trading as 'residential building work' under the *Home Building Act 1989*, with the BCA forming part of the requirements for the quality of construction under that Act.

In New South Wales, plumbers perform a range of different types of work including: work on the drinking water supply in premises (which includes bathroom taps and showers), sanitary drainage systems (such as toilets), roof plumbing (guttering), and even garden reticulation systems (sprinklers). It is also open to non-plumbers (builders) to do some of these types of work e.g. roof plumbing.

When the work is roof plumbing (guttering), the work is covered by the protections of the Home Building Act, including that it be performed by an appropriately licensed person with expertise in roof plumbing, and that it comply with the BCA.

When work involves the drinking water supply or sanitary drainage in premises, the work is regulated by the local plumbing regulator, generally either Sydney Water, Hunter Water, or the local council or county council, and must be performed by a licensed plumber, and comply with the NSW Code of Practice for Plumbing and Drainage.

The fact that both the BCA and the NSW Code of Practice are built on AS3500 does not in itself give rise to any inconsistency, as different parts of AS3500 apply to different types of work.

The Sydney Water and Hunter Water Corporations, local councils and other plumbing regulators do not regulate roof plumbing. However, Fair Trading is aware that the terms of the relevant legislation, including the various definitions of plumbing and drainage work, differ across legislative instruments and may cause confusion. This confusion is one of the reasons why the current plumbing reform process was commenced. As part of that reform process, it is proposed to clarify the current legislation to remove any potential for confusion.

The risks to consumers, the public, and the environment from faulty work in relation to drinking water and the removal of sanitary waste are of a different scale than the risks of faulty guttering. It is appropriate that these are regulated differently to ensure that regulatory effort is focussed on areas of higher risk, and that red tape for industry and consumers is minimised.

I have attached some more detail on the regulation of roof plumbing work, the NSW Code of Practice for Plumbing and Drainage, and the status of proposed reforms to the plumbing regulatory framework in New South Wales for the information of the Committee.

Yours sincerely



Steve Griffin
Deputy Commissioner
Fair Trading Operations
16 December 2010

Regulation of roof plumbing in NSW

For new building projects or renovations requiring development approval (including complying development), the *Environmental Planning and Assessment Act 1979* requires compliance with the Building Code of Australia, including for the roof plumbing (guttering) components.

Roof plumbing work is regulated by NSW Fair Trading, like other building trades, under the *Home Building Act 1989* and is subject to licence requirements and statutory warranties. This means that only appropriately licensed and qualified tradespeople – generally plumbers or builders – can carry out this work.

On the other hand, specialist plumbing and drainage work, which is specifically defined to not include roof plumbing, can only be carried out by a licensed plumber.

Under the *Home Building Regulation 2004*, all residential building work (including roof plumbing) must comply with certain quality requirements, including the Building Code of Australia, any other relevant codes, standards and specifications that the work is required to comply with under any law, and other relevant consent conditions. Part 3.5.2 of the Building Code specifically provides standards for the design and construction of downpipes and gutters, based on compliance with performance requirements or specific parts of AS3500 as the 'deemed to satisfy' solution. This means that in practice, NSW Fair Trading inspectors require roof plumbing work to meet the standards of the Building Code.

The Building Code of Australia, as is the case with the NSW Code of Practice for Plumbing and Drainage, does not have any inherent legal force except to the extent that it is referred to in legislative instruments.

NSW Code of Practice for Plumbing and Drainage

The NSW Code of Practice for Plumbing and Drainage is a document published and maintained by the Committee on Uniformity of Plumbing and Drainage Regulation in NSW (CUPDR). CUPDR membership comprises relevant government agencies: NSW Office of Water (Chair), Country Energy, Sydney and Hunter Water Corporations, Departments of Health, Local Government, Planning, NSW TAFE and NSW Fair Trading (a division of the Department of Services, Technology and Administration). CUPDR also involves industry observers: including the Association of Hydraulic Services Consultants Australia, the Master Plumbers Association, and councils.

The NSW Code of Practice adopts AS3500 as the relevant technical standard, with a number of local variations to that standard. The NSW Code of Practice has no inherent regulatory force, except to the extent that it is referred to in legislative instruments.

At present, the NSW Code of Practice is called up by numerous pieces of legislation for a variety of types of work in specified situations. For example:

- Sydney Water Regulation 2006: requires plumbing and drainage work, as defined in the Regulation, to comply with the NSW Code of Practice;
- Hunter Water Regulation 2010: requires plumbing and drainage work, as defined in the Regulation, to comply with the NSW Code of Practice;
- Local Government Regulation 2005: requires water supply, sewerage and stormwater drainage work, as well as the laying of housepipes for connection to a council's water supply system, to comply with the NSW Code of Practice. This regulation also allows

greywater diversion to be carried out without council approval in certain circumstances, subject to compliance with the NSW Code of Practice;

- *Water Management (Water Supply Authorities) Regulation 2004*: requires water services, sewerage services and plumbing work to comply with the Code of Practice;
- *Water Industry Competition Act 2006*: requires water meters connected to a licensee's water main and customer's installations connecting to a licensee's sewer main to comply with the NSW Code of Practice.

In practice, Sydney Water, Hunter Water and local councils do not regulate roof plumbing. However, we note that the terms of the relevant legislation, including the various definitions of plumbing and drainage work, differ across legislative instruments and may cause confusion. As part of the current reform of the regulatory framework for plumbing and drainage as discussed below, it is proposed to clarify the current legislation to reflect present regulatory practice.

Is there an inconsistency between the BCA and NSW Code of Practice?

No. The two Codes operate side by side, each regulating different types of work. Neither has precedence over the other.

The fact that both the Building Code and the NSW Code of Practice are built on AS3500 does not in itself give rise to any inconsistency, as different parts of AS3500 apply to different types of work.

The risks to consumers, the public, and the environment from faulty work in relation to drinking water and the removal of sanitary waste are of a different scale than the risks of faulty guttering. It is appropriate that these are regulated differently to ensure that regulatory effort is focussed on areas of higher risk, and that red tape for industry and consumers is minimised.

NSW Fair Trading when regulating roof plumbing work, applies the Building Code and not the NSW Code of Practice, as the relevant test for determining whether the work meets the required standards.

Proposed reforms to the plumbing regulatory framework in New South Wales

The Government has prepared a package of reforms to the plumbing regulatory framework in New South Wales to streamline the system and apply consistent standards for work across the State. As part of these reforms, NSW Fair Trading will become the single regulator of on-site plumbing and drainage work in the State. At present, regulatory responsibility sits with Sydney Water, Hunter Water and more than 100 other water utilities, councils and county councils.

In addition, it is proposed to replace the NSW Code of Practice with the Plumbing Code of Australia as the technical standard for plumbing and drainage work in New South Wales. The Plumbing Code of Australia is a performance-based Code, which provides performance requirements for plumbing and drainage work, while adopting AS 3500 as the 'deemed to satisfy' solution. However, until such time as the reforms are in place, the NSW Code of Practice will continue to operate as the technical standard for plumbing and drainage work.

A Bill giving effect to the reforms – the *Plumbing Bill 2010* – was passed by the Legislative Assembly on 25 November 2010 and introduced to the Legislative Council on 30 November 2010. No amendments were made to the Bill and it was not referred to a Parliamentary Committee. The Bill did not proceed to debate in the Legislative Council before Parliament rose for the year. It is anticipated that the reforms will proceed in 2011.

These reforms will not affect the regulation of roof plumbing in practice, which will continue to be regulated as building work under the Home Building Act. The reforms, as already noted will also clarify and harmonise the various definitions of plumbing and drainage work in legislation generally.

Appendix D – Chronology of changes to the BCA provided to the Committee by the Australian Building Codes Board

BCA	Date of adoption in NSW	Performance Requirement	ACM (Standard)	Acceptable Construction Practice (ACP)	Explanatory information	Comments
BCA 96	1 Jul 1997		3500.3: 1990			
BCA 96 Amdt 2	27 Feb 1998	-	-	Changed	-	See Note below: The ACP changed in BCA 96 Amdt 2. Reference to overflow boxes was removed and “or the like” was inserted.
<p>Original (BCA 96 Amdt 0): <i>Where high fronted gutters are installed, provision must be made to avoid any overflow from overflowing back into the roof or building structure (i.e. install slotted gutters, overflow boxes with a mid-section size of 150x150 mm at not more than 2 m centres).</i></p> <p>BCA Amdt 2: <i>Where high fronted gutters are installed, provision must be made to avoid any overflow from flowing back into the roof or building structure by installing slotted gutters or the like.</i></p>						
BCA 96 Amdt 3	1 July 1998	-	Changed to 3500.3.2: 1998	Changed	-	ACM changed to AS 3500.3.2 and ACP Table 3.5.2.2b ‘Gutter sizes for various rainfall intensities’ altered – Type F gutters (required in large roof catchment areas with high rainfall density) were previously to be designed in accordance with AS 2180, now to use AS 3500.3.2
BCA 96 Amdt 4	1 Feb 1999	-	3500.3.2: 1998 New Amdt 1: 1998	Changed	Changed	Include Amdt 1 to 3500.3.2; ACP explanatory info changed (See below); ACP Table 3.5.2.1 changed to correct Broken Hill rainfall intensity.

BCA	Date of adoption in NSW	Performance Requirement	ACM (Standard)	Acceptable Construction Practice (ACP)	Explanatory information	Comments
<p><u>Original Explanatory Information (BCA 96 Amdt 0):</u> <i>Stormwater drainage systems specified in the Housing Provisions are not designed to remove all of the water during exceptionally heavy rain, especially in tropical areas. Accordingly, it is necessary to design and install the system so that when overflowing occurs any water is directed away from the inside of the building.</i></p> <p><i>This may be achieved by using slotted gutters, locating the gutter so that it is below the top edge of the fascia or installing rainwater heads with overflow slots etc.</i></p> <p><i>To enable the drainage system to achieve optimum capacity it must be cleaned and maintained on a regular basis, especially in areas where large trees overhang roof drainage systems.</i></p> <p><i>Special attention needs to be given to box gutters, valley gutters etc located above the internal areas of a building. In these situations if adequate overflow controls cannot be implemented there may be a need to increase the size and capacity of drainage components to remove all water anticipated during heavy rain periods. The design for such systems can be taken from AS 3500.3.</i></p> <p><u>Amdt 4 Explanatory Information:</u> <i>Stormwater drainage systems specified in the Housing Provisions are not designed to remove all of the water during exceptionally heavy rain, especially in tropical areas. Accordingly, it is necessary to design and install the system so that when overflowing occurs any water is directed away in a manner which ensures it does not pond against, or enter into, the building.</i></p> <p><i>This may be achieved by using slotted gutters, oversized gutters and downpipes, locating the gutter so that it is below the top edge of the fascia or the installation of rainwater heads with overflow slots.</i></p> <p><i>The installation of downpipes, especially near valley gutters, is designed to ensure rainwater from areas on the roof that have concentrated water flows perform adequately. If downpipe spacings are to be increased, allowance for overflow should be considered.</i></p> <p><i>Consideration needs to be given to box gutters, valley gutters etc located above the internal areas of a building. In these situations if adequate overflow controls cannot be implemented there may be a need to increase the size and capacity of drainage components to remove all water anticipated during heavy rain periods.</i></p> <p><i>There are many options available to designers using the requirements of the Housing Provisions. The designer will need to choose an overflow system that will cope with the expected rain intensity, i.e. in heavy downpours a slotted gutter may be inadequate.</i></p>						

BCA	Date of adoption in NSW	Performance Requirement	ACM (Standard)	Acceptable Construction Practice (ACP)	Explanatory information	Comments
BCA 96 Amdt 5	1 August 1999	Changed	-	-	-	Performance Requirements ARIs changed (See below)
<u>BCA 96 Amdt 4 Performance Requirement P2.2.1:</u>						
<p><i>(a) Surface water, resulting from a storm having an average recurrence interval of 10 years and which is collected or concentrated by a building or sitework, must be disposed of in a way that avoids the likelihood of damage or nuisance to any other property.</i></p> <p><i>(b) Surface water, resulting from a storm having an average recurrence interval of 50 years must not enter the building.</i></p>						
<u>BCA 96 Amdt 5 Performance Requirement P2.2.1:</u>						
<p><i>(a) Surface water, resulting from a storm having an average recurrence interval of 20 years and which is collected or concentrated by a building or sitework, must be disposed of in a way that avoids the likelihood of damage or nuisance to any other property.</i></p> <p><i>(b) Surface water, resulting from a storm having an average recurrence interval of 100 years must not enter the building.</i></p>						
BCA 96 Amdt 8	1 January 2001	-	3500.3.2: 1998 Amdt 1: 1998 New 3500.5: 2000	Changed	-	New Standard 3500.5 referenced; ACP Table 3.5.2.2 change to reflect reference to 3500.5.
BCA 96 Amdt 12	1 Jan 2003	-	3500.3.2: 1998 Amdt 1: 1998 3500.5: 2000 New Amdt 1: 2002	-	-	Include Amdt 1 to 3500.5

BCA	Date of adoption in NSW	Performance Requirement	ACM (Standard)	Acceptable Construction Practice (ACP)	Explanatory information	Comments
2004	1 May 2004	-	New 3500.3: 2003 3500.5: 2000 Amdt 1- 2002	-	-	New Standard 3500.3 referenced. Removed 3500.3.2.
2006	1 May 2006	-	3500.3: 2003 3500.5: 2000 Amdt 1: 2002 Amdt 3: 2006	-	-	Include Amdt 3 to 3500.5
2007	1 May 2007	-	3500.3: 2003 3500.5: 2000 Amdt 1: 2002 New Amdt 2: 2004 Amdt 3: 2006	Changed	-	Relocation of ACP 3.5.2.5(d) to 3.5.2.4(d). The words "flowing back" were also deleted (see below). Insert Amdt 2 to 3500.5

BCA 2006 3.5.2.5 (d)

Where high-fronted gutters are installed, provision must be made to avoid any overflow from flowing back into the roof or building structure by installing slotted gutters or the like.

BCA	Date of adoption in NSW	Performance Requirement	ACM (Standard)	Acceptable Construction Practice (ACP)	Explanatory information	Comments
<p><u>BCA 2007 3.5.2.4(d)</u></p> <p><i>Where high-fronted gutters are installed, provision must be made to avoid any overflow back into the roof or building structure by installing slotted gutters or the like.</i></p>						
2008	1 May 2008	-	3500.3: 2003 New Amdt 1 3500.5: 2000 Amdt 1: 2002 Amdt 2: 2004 Amdt 3: 2006 New Amdt 4	-	-	Insert Amdt 1 to 3500.3 and Amdt 4 to 3500.5
2009	1 May 2009	-	3500.3: 2003 Amdt 1 3500.5: 2000 Amdt 1: 2002 Amdt 2: 2004 Amdt 3: 2006	Changed	-	Change to ACP 3.5.2.4 to remove reference to slotted gutters (see below), for consistency purposes – to align with ACM 3500.3 and 3500.5.

BCA	Date of adoption in NSW	Performance Requirement	ACM (Standard)	Acceptable Construction Practice (ACP)	Explanatory information	Comments
			Amdt 4			
<p><u>BCA 2007 3.5.2.4(d)</u></p> <p><i>Where high-fronted gutters are installed, provision must be made to avoid any overflow back into the roof or building structure by installing slotted gutters or the like.</i></p> <p><u>BCA 2009 3.5.2.4(d)</u></p> <p><i>Where high-fronted gutters are installed, provision must be made to avoid any overflow back into the roof or building structure by incorporating overflow measures or the like.</i></p>						
2011	1 May 2011	-	3500.3: 2003 Amdt 1 Amdt 2 3500.5: 2000 Amdt 1: 2002 Amdt 2: 2004 Amdt 3: 2006 Amdt 4	-	-	Insert Amdt 2 to 3500.3

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