BUILDING
PERFORMANCE

Consultation document
Building Code update 2022
Plumbing and drainage

Issuing and amending acceptable solutions and verification methods

2 MAY 2022

MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Te Kāwanatanga o Aotearoa
New Zealand Government

Ministry of Business, Innovation and Employment (MBIE)

Hīkina Whakatutuki – Lifting to make successful

MBIE develops and delivers policy, services, advice and regulation to support economic growth and the prosperity and wellbeing of New Zealanders.

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May 2022

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Preface

The Building Code forms a key part of our building regulatory system in New Zealand. It sets the minimum performance for the design of buildings. The Ministry of Business, Innovation and Employment (MBIE) is responsible for updating the Building Code and its documents so we can keep pace with innovation, current construction methods and the needs of contemporary New Zealand.

At MBIE, we aim for a balance between setting minimum performance requirements where necessary to ensure buildings are safe, healthy and durable, and encouraging higher standards of performance where this will impact positively on outcomes for the country. The changes we are proposing aim to ensure new buildings better protect the safety of the people who use them.

This consultation document includes the details of the plumbing and drainage proposals which aim to improve the safety and reliability of new plumbing systems. This includes changes to the Building Code compliance pathways for water supply, foul water and surface water systems. These proposals are the latest in a series of continuous improvements intended to support plumbing and drainage work and ensure these Building Code compliance pathways are fit for purpose and up to date.

Altogether, the changes aim to give New Zealanders greater confidence that water from a tap is healthy and safe.

Our counterparts at the Australian Building Code Board have been instrumental in supporting the development of these proposals, leading the way on their ambitious work programme to introduce new plumbing requirements across the Tasman. We have drawn on their research and collaborated with our colleagues at the Ministry of Health and Taumata Arowai, New Zealand's new dedicated water regulator, to inform this document.

Please take the time to let us know your thoughts. MBIE will carefully consider and weigh all submissions before making any decisions. You can provide feedback by following the instructions on MBIE's Have Your Say webpage.

Final decisions on the changes will be made and communicated later this year.

Seeking feedback on plumbing and drainage proposals

In this consultation, we seek your feedback on the following proposals:

Proposal 1. Lead in plumbing products
Proposal 2. Water temperatures
Proposal 3. Protection of potable water
Proposal 4. AS/NZS 3500 Plumbing and drainage standards
Proposal 5. Water system supply components
Proposal 6. Plumbing and drainage system material standards
Proposal 7. Resolving conflicts and editorial changes

How to provide feedback

We invite you to submit feedback on the Building Code update by 5:00pm on Friday, 1 July 2022.

- You can provide your feedback by completing a survey online via MBIE's Have Your Say webpage, or
- You can download a form at www.mbie.govt.nz and send it to us by email or post.
  - Email to: buildingfeedback@mbie.govt.nz, with subject line Building Code consultation 2022
  - Post to:

    Building System Performance
    Ministry of Business, Innovation and Employment
    PO Box 1473
    Wellington 6140

Your feedback will contribute to further development of the Building Code.

Release of information

MBIE may publish copies or excerpts of submission to MBIE's website at www.mbie.govt.nz. MBIE will consider you to have consented to publishing by making a submission, unless you clearly specify otherwise in your submission.

If your submission contains any information that is confidential or you otherwise wish us not to publish it, please:

- indicate this at the start of your submission, with any confidential information clearly marked within the text
- provide a separate version excluding the relevant information for publication on our website.

Submissions will also become official information, which means it may be requested under the Official Information Act 1982 (OIA). The OIA specifies that information is to be made available upon request unless there are sufficient grounds for withholding it. If we receive a request, we cannot guarantee that feedback you provide us will not be made public. Any decision to withhold information requested under the OIA is reviewable by the Ombudsman. If you have any objection to the release of any information in the submission, and in particular, which parts you consider should be withheld, please set this out in your submission together with the reasons for withholding the information. MBIE will take such objections into account and will consult with submitters when responding to requests under the Official Information Act 1982.

Private information

The Privacy Act 2020 establishes certain principles with respect to the collection, use and disclosure of information about individuals by various agencies, including MBIE. Any personal information you supply to MBIE in the course of making a submission will only be used for the purpose of assisting in the development of advice in relation to this consultation or for contacting you about your submission. We may also use personal information you supply in the course of making a submission for other reasons permitted under the Privacy Act 2020 (e.g. with your consent, for a directly related purpose, or where the law permits or requires it). Please clearly indicate in your submission if you do not wish your name, or any other personal information, to be included in any summary of submissions that MBIE may publish.

We will only retain personal information as long as it is required for the purposes for which the information may lawfully be used. Where any information provided (which may include personal information) constitutes public records, it will be retained to the extent required by the Public Records Act 2005. We may also be required to disclose information under the Official Information Act 1982, to a Parliamentary Select Committee or Parliament in response to a Parliamentary Question. You have rights of access to and correction of your personal information which can be found on the MBIE website at www.mbie.govt.nz.

Plumbing and drainage – Long term strategy

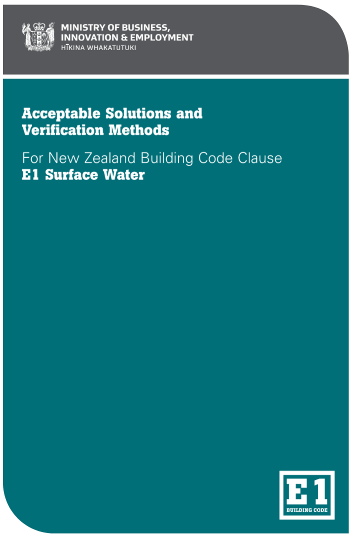
This year we are proposing changes to the New Zealand Building Code (Building Code) compliance pathways for water supplies, foul water and surface water that support plumbing and drainage work in New Zealand.

These proposals are the latest in a series of continuous improvements to ensure the Building Code compliance pathways for the plumbing sector are fit for purpose and up to date to help New Zealanders have safe and reliable plumbing systems.

This update will help support the provision of plumbing and drainage services that comply with the Building Code and meet the safety and wellbeing objectives in the Building Act 2004.

The 2022 Plumbing and drainage update is focused on improving the means of complying with the following three Building Code clauses:

- E1 Surface Water – Disposal of rainwater and confirmation surface water cannot enter the building.
- G12 Water Supplies – Requires the safe supply, storage, reticulation and delivery of hot and cold water.
- G13 Foul Water – Requires the safe disposal of foul water to prevent illness and the loss of amenity due to odour and accumulated matter.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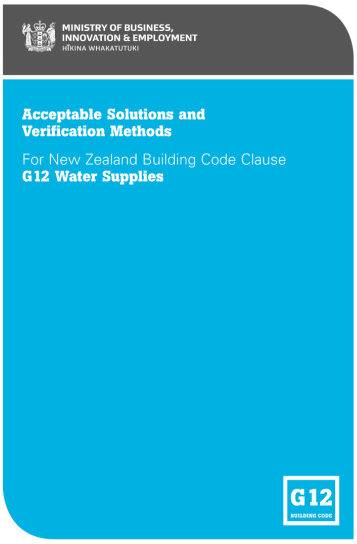
Acceptable Solutions and Verification Methods

For New Zealand Building Code Clause
E1 Surface Water

E1
BUILDING CODE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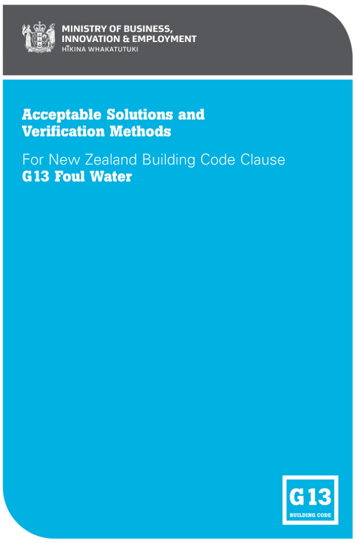
Acceptable Solutions and Verification Methods

For New Zealand Building Code Clause
G12 Water Supplies

G12
BUILDING CODE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Acceptable Solutions and Verification Methods

For New Zealand Building Code Clause
G13 Foul Water

G13
BUILDING CODE

This update supports MBIE's commitment to the ongoing development of technical Building Code solutions within the plumbing technical focus area, and is a key step towards:

- Modernising the compliance pathways for the plumbing sector to incorporate technical innovation and research which support current hydraulic theory and installation practices.
- Promoting consistent outputs by improving alignment between Building Code compliance pathways for the plumbing sector.
- Addressing targeted technical issues and gaps within existing compliance pathways.

At the same time, other government legislative programmes are informing the work required in the plumbing and drainage space. These include:

- New Zealand Government's response to climate change and the Climate Change Response (Zero Carbon) Amendment Act 2019 which drives our climate change policy towards low greenhouse gas emissions (emissions) and climate resilience in New Zealand.
- Three Waters Reform Programme including the introduction of the Water Services Act 2021 which will help ensure all New Zealanders have safe, reliable drinking water, wastewater and stormwater services.
- Building Products Information Law changes which will ensure that basic information about building products and how to use them is available to users in New Zealand.

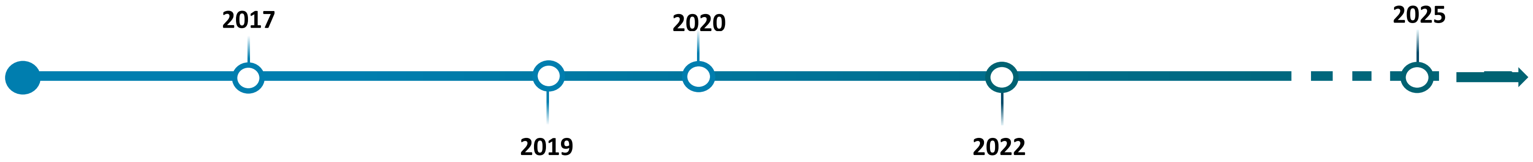
One of the challenges is that plumbing and drainage requirements in the Building Code are fragmented between various Building Code clauses, acceptable solutions and verification methods. This makes it challenging to ensure designs and installations comply with all relevant aspects of the Building Code. There are opportunities to improve consistency, clarity and certainty in these requirements and create a more user centric approach to address the issues.

Along with that, we have recognised the importance of the standards cited for plumbing and drainage systems and have looked to adopt the most recent version of these standards. Building Code compliance relies heavily on cited standards for the compliance of pipe materials and plumbing and drainage system installations. This is reflected in the priorities and focus of past updates which have focused on maintaining current citation of a number of standards.

The timeline on the next page illustrates how we propose to continuously improve compliance pathways for the plumbing sector and embed operational efficiency and carbon reduction approaches into the building system's regulatory framework over time. At this stage, this timeline is indicative and subject to amendment based on government decisions and sector feedback. It will be built on and finalised to provide the sector with early and clear signals about future changes.

Plumbing and drainage update timeline

Strengthening Current Building Code Compliance Pathways



- 🟩 Hot water cylinder safe tray provisions updated to prevent water damage in G12/AS1

- 🟩 AS/NZS 3500: 2018 Parts 1, 2 and 4 cited as means of complying with G12 Water Supplies and G13 Foul Water

- 🟩 AS/NS 3500: 2018 Part 3 cited as a means of complying with E1 Surface Water
- 🟩 Rainfall intensity data updated in E1/AS1
- 🟩 Updated product manufacturing and installation standards cited as means of complying with G13 Foul Water
- 🟩 Kitchen and laundry sink integral overflow provisions introduced in E3/AS1

- 🟨 Lead in plumbing products proposed to be reduced to maintain public health under G12 Water Supplies
- 🟨 Hot water delivery temperatures proposed to be lowered to reduce the risk of scalding under G12 Water Supplies
- 🟨 AS/NZS 3500: 2021 Parts 1, 2, 3 and 4 proposed to be cited as means of complying with E1 Surface Water, G12 Water Supplies and G13 Foul Water
- 🟨 Backflow prevention provisions proposed to be improved to protect drinking water from backflow contamination in G12/AS1
- 🟨 Water supply system component updates proposed in G12/AS1
- 🟨 Updated plumbing and drainage system materials standards proposed to be cited under E1 Surface Water, G12 Water Supplies and G13 Foul Water

- ⬜ Ongoing development of AS/NZS 3500
- ⬜ Plumbing system water and energy efficiency updates

Key:
🟩 Completed change
🟨 Current focus area
⬜ Future focus area

1. Lead in plumbing products

We are proposing to limit the allowable lead content in plumbing products which contain copper alloys and are intended for use in contact with drinking water to not more than 0.25%. These new requirements are proposed for inclusion in the acceptable solutions for Building Code clause G12 Water Supplies. The transition period is proposed to end on 1 September 2025 to provide plumbing product manufacturers and suppliers time to make the necessary changes.

1.1. Reasons for the change

The use of lead in the manufacture of plumbing products has been common practice for many centuries. It is most commonly found in copper alloys, such as brass and bronze, where a small amount of lead is added to provide malleability. These alloys are frequently used as components of plumbing products in contact with drinking water.

In New Zealand, small amounts of lead are currently allowed in the raw materials used to manufacture some plumbing products, provided it does not contaminate the water. Products that contaminate drinking water are not code compliant.

Lead has long been recognised as a cumulative toxin and people can be exposed to lead from ingestion of airborne dust, water, food and soil. While existing products that comply with the Building Code are safe, health officials recommend that where possible, exposure to lead should be reduced. The World Health Organisation (WHO) also recommends all practical measures to reduce exposure to lead should be implemented, including the use of low lead alloy fittings in new plumbing installations or repairs[1].

Australia has recently announced changes to limit the allowable level of lead in plumbing products[2]. This step aligns closely with existing lead-free plumbing products requirements in North America. As such, this is a timely opportunity for New Zealand to adopt similar requirements. In this consultation, we are seeking feedback on whether New Zealanders would support this move to continue to reduce the amount of lead in our built environment.

1.2. Proposed change

The proposed change includes:

- Limiting the maximum lead content to 0.25% for any product that contains copper alloy and is intended for use in contact with potable water for human consumption. This would include products such as pipe fittings, valves, taps, mixers, water heaters and water meters. See example images of these products in Figure 1.1.
- Requiring the lead content for these products be verified through a test report from an accredited laboratory in accordance with the standard NSF/ANSI/CAN 372.
- Providing a transition period to 1 September 2025 which aligns with the time when equivalent requirements will come into force in Australia.
- Clarifying that copper alloy plumbing products must be suitably resistant to premature corrosion from dezincification.

The proposed requirements will involve an amendment to Building Code Acceptable Solution G12/AS1 Water Supplies. This proposed change will not affect existing plumbing systems unless they are being altered or replaced. However, it would apply to all new plumbing work even if it does not need a building consent.

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[1] WHO Guidelines for drinking-water quality, 4th edition, incorporating the 1st addendum

[2] ABCB Lead in plumbing products - Final Decision RIS

Proposal 1. Lead in plumbing products

For more details on the specifics of the proposed change, please refer to Appendix B.

FIGURE 1.1: Examples of plumbing products such as taps and brass fittings affected by this proposal

1.3. Options considered

For this proposal, MBIE has considered the following two options against the status quo:

Option 1. Propose changes to the current plumbing product testing standard (AS/NZS 4020)

This option considered proposing changes to the maximum allowable concentration of lead within the joint Australian/New Zealand standard AS/NZS 4020 for the testing of products for use in contact with drinking water.

Option 2. Require all products in contact with drinking water to contain 0.25% or less lead content

This option considered amending the Acceptable Solution G12/AS1 to restrict the maximum allowable lead content within plumbing products that contain copper alloy and are intended for use in contact with potable water for human consumption to 0.25% or less when calculated using a weighted average against the wetted surface area and evaluated against NSF/ANSI/CAN 372: 2020 Drinking Water System Components - Lead Content. This option would closely align requirements under the Building Code with changes being introduced in Australia and existing requirements for lead free plumbing products in North America.

1.4. Analysis of the proposed change

1.4.1. Objectives of the proposal

The primary objective of this proposal is to further reduce the potential for exposure to lead from plumbing products that are in contact with potable water. While existing products that comply with the Building Code are safe, health officials recommend that exposure to lead should be reduced, where possible.

This contributes to achieving Objective G12.1 (a) of the Building Code, Functional requirement G12.2 and Performance criteria G12.3.2 (c). These clauses of the Building Code state:

Objective

G12.1 The objective of this provision is to–

(a) safeguard people from illness caused by contaminated water.

Functional requirement

G12.2 Buildings provided with water outlets, sanitary fixtures or sanitary appliances must have safe and adequate water supplies.

Performance

G12.3.2 A potable water supply system shall be–

(c) installed using components that will not contaminate the water.

1.4.2. Methodology to determine the allowable levels of lead

The current allowable amount of lead varies depending on the plumbing product and is regulated under the Building Code through both manufacturing standards and via the adoption of the Australian and New Zealand standard AS/NZS 4020 Testing of Products for Use in Contact with Drinking Water. Lead water levels must not exceed 10 micrograms (µg) per litre (L) of water when tested in accordance with this standard. Products that comply with this standard have been tested to ensure the maximum level of lead leaching from the product does not exceed the maximum acceptable level set by the Drinking Water Standards for New Zealand[3].

As part of the analysis, we considered changing the maximum acceptable value for lead leaching from a product within the AS/NZS 4020 standard. However, following consultation with regulators in Australia, industry groups and accredited testing laboratories, several challenges with implementing this option were revealed. This option was discontinued from further analysis on the basis that limiting the allowable proportion of lead in the source material (Option 2) was considered to address the issue more effectively when compared to reducing the allowable level of lead leaching from a product into drinking water.

We determined that amending Acceptable Solution G12/AS1 as outlined in Option 2 was the most effective way in which to further limit lead in new plumbing installations. The proposed approach to reducing the maximum lead content in plumbing products was discussed with various parties including health officials, Australian regulators, industry groups, product suppliers and accredited product testing laboratories. This option was identified as the most reasonable option for reducing the potential for exposure to lead from plumbing products in contact with potable water.

This approach includes:

- Limiting the maximum lead content to 0.25% for any product that contains copper alloy and is intended for use in contact with potable water for human consumption.
- Using the standard NSF/ANSI/CAN 372: 2020 Drinking Water System Components - Lead Content to calculate the allowable lead content based on a weighted average against the wetted surface area.

The limit is proposed to be set at 0.25% weighted average in recognition that it is not always possible to source 100% lead-free raw material. This also ensures parity with the international market for lead free copper alloy plumbing products.

1.4.3. Impacts of the proposed change

There are a number of product categories impacted by this option and these categories include subsets of many product types ranging in size and value.

Costs and benefits of the changes were assessed qualitatively. MBIE expects the following from this change:

- Limiting the allowable lead levels will further reduce the risk of exposure to lead from plumbing system components.
- Introducing this change in alignment with Australia is expected to result in limited cost increases for plumbing product manufacturers and suppliers in New Zealand, as most of the affected products are also supplied into the Australian market.
- This proposed change will continue to support the wider government Three Waters Reform objective of ensuring safe, reliable drinking water supplies.

As part of the options, we also considered what the transition period for this change should be. For the different transition periods, MBIE expects the following impacts from this change:

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[3] Drinking-water Standards for New Zealand

- With a Shorter transition period – Manufacturers and suppliers would not have sufficient time to make the necessary changes to support the availability of products. This could lead to further supply chain constraints which have been heightened due to the Covid-19 pandemic.
- With a Longer transition period – This would mean that new buildings could still be constructed with higher levels of lead in the plumbing products. Products unable to be used in Australia could be used in New Zealand.

Aligning the implementation with the timeframe proposed in Australia of 1 September 2025 provides a balance of these factors.

1.5. Transitions

Effective date for G12/AS1 Paragraph 2.1.3: 1 September 2025

Transitional arrangements: 34 months (3 November 2022 to 1 September 2025)

The transition period for this change is proposed to end on 1 September 2025 at the same time as the equivalent requirements G12/AS1 come into force in Australia. This transition period will only apply to the proposed requirement in G12/AS1 Paragraph 2.1.3.

This transition period is proposed to provide manufactures and suppliers time to make the necessary changes support the availability of products in New Zealand.

It is proposed that the existing Acceptable Solution G12/AS1 water quality provisions will remain in force, as if not amended, for a period of 12 months until 2 November 2023 (the proposed transition period cessation date) as described in TABLE 1.1.

The proposed transition period of 12 months is intended to align with those for other proposals. This is intended to minimise confusion on the dates that the documents and requirements come into effect. On 2 November 2023, the proposed new G12/AS1 can be used with Paragraph 2.1.3 effective date for a transition period of 34 months. The draft text for this arrangement is provided in Appendix B.

TABLE 1.1: Proposed transitional arrangements for the new requirements for lead in plumbing products

Document	Before 3 November 2022	From 3 November 2022 (effective date) To 2 November2023 (cessation date)	From 2 November 2023 To 1 September 2025	On 1 September 2025
Existing Acceptable Solution G12/AS1	If used, will be treated as complying with the Building Code	If used, will be treated as complying with the Building Code	Does not apply to Building Consents issued after this date	Does not apply to Building Consents issued after this date
Amended Acceptable Solution G12/AS1	Does not apply to Building Consents issued before this date	If used, will be treated as complying with the Building Code	If used, will be treated as complying with the Building Code	Does not apply to Building Consents issued after this date
Amended Acceptable Solution G12/AS1 Paragraph 2.1.3	Does not apply to Building Consents issued before this date	If used, will be treated as complying with the Building Code	If used, will be treated as complying with the Building Code	If used, will be treated as complying with the Building Code

1.6. Questions for the consultation

1-1. Do you support amending Acceptable Solution G12/AS1 as proposed to limit the allowable lead content in plumbing products?

1-2. What impacts would you expect on you or your business from the proposed change?
These impacts may be economic/financial, environmental, health and wellbeing, or other areas.

1-3. What support would you or your business would need to implement the proposed change if introduced?

1-4. Do you agree with the proposed transition time of 34 months for these proposed new requirements to take effect on 1 September 2025?

☐ Yes, it is about right
☐ No, it should be longer (4 years or more)
☐ No, it should be shorter (less than 34 months)
☐ Not sure/no preference

2. Water temperatures

We are proposing to reduce the maximum temperature of hot water at the tap to reduce the risk of scalding injuries to New Zealanders. The maximum allowable temperature for most buildings is proposed to be reduced from 55°C to 50°C. For early childhood centres, the maximum allowable temperature is proposed to be reduced from 45°C to 40°C to align with Ministry of Education requirements. The proposed changes would only apply to new plumbing fixtures used for personal hygiene, such as hand basins, baths and showers.

These changes are proposed to be introduced into Building Code Acceptable Solution G12/AS1, along with additional temperature control devices and pressure requirements which will improve alignment with the AS/NZS 3500 plumbing and drainage standards.

2.1. Reasons for the change

Hot water supply must be adequate to meet New Zealanders' needs while also keeping them safe. Currently, the Building Code requires hot water systems to be controlled to prevent the growth of legionella bacteria, which is usually achieved by storing heated water at a temperature of 60°C or higher. However, the Building Code also requires hot water to be provided at a temperature that avoids the likelihood of scalding. We must be cautious about the temperature of water delivered to taps in our homes, to ensure they are safe for everyone to use.

According to the World Health Organisation (WHO), burns are a global public health problem and are particularly common in early childhood[4]. Scalds are the most commonly treated burn injury in young children. Scald injuries may result from exposure to very hot liquids for only a short duration, ie "spill/splash," and also as a result of "immersion" in more moderate temperature liquids for relatively longer durations eg "a bath".

Those most vulnerable from tap water scalds are infants, young children, elderly people and disabled people. The Burns Registry of Australia and New Zealand led a study into people with tap water scalds admitted to Australian or New Zealand burn centres between 2010 and 2019[5]. The study found that 130 people with tap water scalds were admitted to NZ burn centres during the specified period, with 65 per cent of severe tap water scalds occurring in young infants and children under four years old, and over 90 per cent of burns occurring in the bathroom while bathing.

Additionally, the significant difference in maximum allowable hot water temperature in New Zealand (55°C) compared to Australia (50°C) poses an increased risk of deeper immersion scalds. Lowering the maximum delivery temperatures is expected to reduce the number of scald injuries across the country.

2.2. Proposed changes

MBIE is proposing to reduce the maximum temperature of hot water at the tap to reduce the risk of scalding injuries to New Zealanders. This proposed change includes:

- Reducing the maximum allowable temperature of hot water delivered to plumbing fixtures used for personal hygiene in most buildings from 55°C to 50°C.
- Reducing the maximum allowable temperature for early childhood centres from 45°C to 40°C to align with Ministry of Education requirements.
- Maintaining the current maximum allowable temperature of 45°C for institutions such as schools, hospitals and care homes.

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[4] Burns (who.int)

[5] The home, the bathroom, the taps, and hot water": The contextual characteristics of tap water scalds in Australia and New Zealand

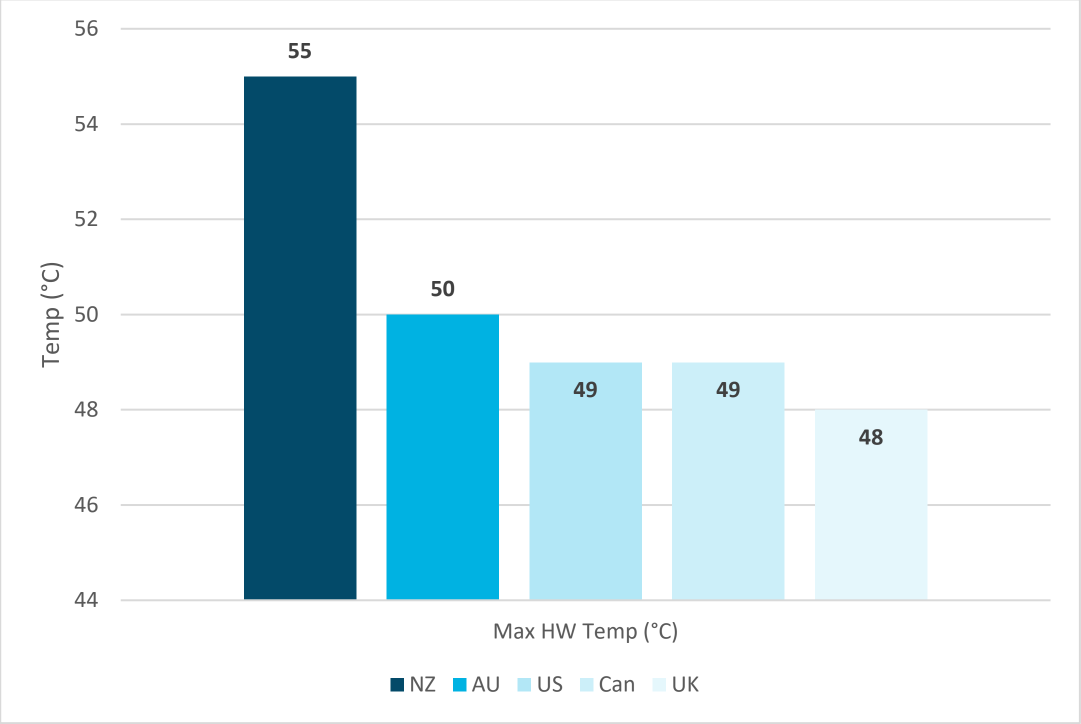
The proposed maximum temperature changes would only apply to new plumbing fixtures used for personal hygiene, such as hand basins, baths and showers. These changes are proposed to be introduced into Building Code Acceptable Solution G12/AS1, along with additional temperature control devices which will provide more ways to control the delivery temperature of hot water. For more details, please refer to Appendix B for proposed water temperature changes within Acceptable Solution G12/AS1.

FIGURE 2.1: 50°C – Proposed max temperature of hot water delivered to new bathroom fixtures in homes.

2.3. Options considered

To determine options for maximum hot water temperatures, MBIE conducted a review of the maximum delivery temperatures in other countries. These temperatures are shown in the graph in FIGURE 2.2.

FIGURE 2.2: Maximum hot water delivery temperatures for bathing



Additionally, it was identified that the Ministry of Education Licensing Criteria for Early Childhood Education and Care Services[6] requires that all early childhood centres are required to deliver a warm water temperature no higher than 40°C.

Based on this review, MBIE considered the following options maximum hot water temperatures against the status quo:

Option 1. 50°C for most buildings; 45°C for schools, hospitals and care homes; and 40°C for early childhood education centres (Recommended)

This option would align the maximum hot water delivery temperatures in G12/AS1 with equivalent temperatures permitted in Australia, temperatures in the standard AS/NZS 3500.4: 2018, and Ministry of Education requirements for early childhood education centres.

Option 2. Reduce the maximum hot water delivery temperature requirements even lower

This option considers whether all buildings should be at 49°C, 48°C, or even lower. These lower temperatures would reflect the requirements found in other parts of the world.

2.4. Analysis of the options

2.4.1. Objectives of the proposal

The objective of this proposal is to reduce the risk of tap water scald injuries to New Zealanders, while still maintaining adequate hot water temperatures for personal hygiene and preventing the growth of legionella bacteria in heated water. This contributes to achieving Objective G12.1 (b) and G12.1 (c)(i) of the Building Code, Functional requirement G12.2 and Performance criteria G12.3.5, G12.3.6 and G12.3.9. These clauses of the Building Code state:

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[6] Refer to the Ministry of Education Licensing Criteria for Early Childhood Education and Care Services available online at www.education.govt.nz.

Objective

G12.1 The objective of this provision is to–

(b) safeguard people from injury caused by hot water system explosion, or from contact with excessively hot water:

(c) safeguard people from loss of amenity arising from–

(i) a lack of hot water for personal hygiene

Functional requirement

G12.2 Buildings provided with water outlets, sanitary fixtures or sanitary appliances must have safe and adequate water supplies.

Performance

G12.3.5 Sanitary fixtures and sanitary appliances must be provided with hot water when intended to be used for–

(a) utensil washing; and

(b) personal washing, showering or bathing.

G12.3.6 Where hot water is provided to sanitary fixtures and sanitary appliances, used for personal hygiene, it must be delivered at a temperature that avoids the likelihood of scalding.

G12.3.9 A hot water system must be capable of being controlled to prevent the growth of legionella bacteria.

Clause G12.3.5 (b) only applies to housing, retirement homes and early childhood centres as defined in clauses A1 and A2 of the Building Code.

The recommended option is the one that provides the best outcome for these different requirements.

2.4.2. Methodology for determining the maximum hot water delivery temperature

To determine the proposed maximum hot water delivery temperatures, MBIE considered the temperature of water required for personal hygiene purposes as well as the risk of scalding posed by different water temperatures.

Most individuals shower or bathe in water close to their internal body temperature at 36-38°C. Thermal hot pools are generally in this range but may be as hot as 42-44°C. Washing in the kitchen and laundry may require hotter temperatures. Similarly, to prevent the growth of legionella bacteria in storage water heating systems, higher water storage temperatures are required (minimum 60°C). As part of this proposal, the proposed maximum delivery temperatures for hot water would only apply to the temperature of water delivered to sanitary fixtures used for personal hygiene, including hand basins, baths and showers. The proposed maximum delivery temperatures would not apply to water delivered to kitchen sinks or laundries as these are not considered sanitary fixtures used for personal hygiene. The minimum temperature for storage water heating systems of 60°C would remain unchanged as this is controlled separately from the maximum delivery temperature.

The risk from scalding depends on both the water temperature and how long the skin has been exposed to that temperature. The higher the temperature, the shorter the time until a burn occurs. This relationship is not direct and minor decreases in temperature can significantly prolong the time for exposure. This is illustrated in FIGURE 2.3.

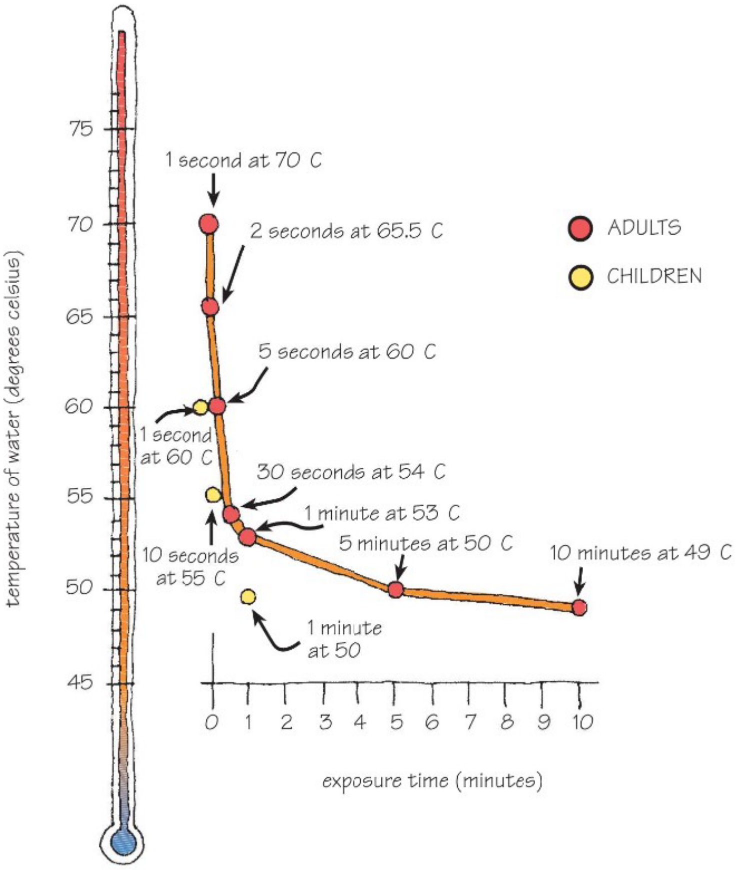
At a water temperature of 55°C, a full skin thickness burn would take 10 seconds for children and 30 seconds for adults. At 50°C, this extends to one minute for children and up to five minutes for adults. Below this temperature, the likelihood of scalding continues to decrease. Additional consideration is required for the skin of very young and older people which are more susceptible to harm.

The current requirements in Acceptable Solution G12/AS1 limit the maximum hot water delivery temperature to 45°C for early childhood centres, schools, rest homes, institutions for people with psychiatric or physical disabilities, and hospitals. This temperature provides a reasonable level of protection to avoid the likelihood of scalding in these facilities. The Ministry of Education sets its own maximum temperature for water delivered from taps that are accessible to children in early childhood education centres[7] at 40°C.

In consideration of these factors,

- A maximum delivery temperature of 50°C is considered to effectively reduce the risk of scalding in most situations, while also being sufficiently hot for personal hygiene purposes.
- A maximum delivery temperature of 45°C is the current requirement for schools, old people's homes, institutions for people with psychiatric or physical disabilities, and hospitals. This remains appropriate.
- A maximum delivery temperature of 40°C for early childhood education centres will align with the Ministry of Education's licensing requirements for the operation of these facilities.

FIGURE 2.3: Time of exposure and water temperature at which full thickness skin scalds can occur



© Copyright BRANZ Ltd, 2004. We would like to thank BRANZ for their permission to use this image from the Plumbing and Drainage Guide 2nd edition in this consultation document.

2.4.3. Temperature control devices

As part of this proposal, MBIE also considered the means for limiting the hot water delivery temperatures. Acceptable Solution G12/AS1 currently provides one means for this through the use of tempering valves and references two standards for the manufacture of tempering valves. Additional options for the control of delivery temperatures were previously found in AS/NZS 3500.4: 2018. However, these options have been removed from the 2021 edition of this standard to avoid a conflict between the Plumbing Code of Australia and the New Zealand Building Code requirements. As a result, additional temperature control devices are proposed for inclusion in G12/AS1 through:

- thermostatic mixing valves
- thermostatically controlled taps

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[7] Refer to the Ministry of Education Licensing Criteria for Early Childhood Education and Care Services available online at www.education.govt.nz.

- temperature limited water heaters.

2.4.4. Impacts of the proposed change

MBIE expects that impacts of this change include:

- A reduction in the number of tap water scald injuries across the country.
- Providing heated water system designers and plumbers greater flexibility to select the most appropriate temperature control device for the particular situation.
- Have minimal cost implications since it involves pre-setting or commissioning temperature control devices to a lower temperature.
- Have negligible impact on the amenity in a building due to lack of hot water for personal hygiene.
- Have no impact on the storage water temperature to prevent the growth of legionella bacteria as the storage temperature is controlled separately from the delivery temperature.

2.5. Transitions

Effective date: 4 November 2022

Transitional arrangements: 12 months

It is proposed that the existing Acceptable Solution G12/AS1 will remain in force, as if not amended, for a period of 12 months until 2 November 2023 (the proposed cessation date) as described in TABLE 2.1.

TABLE 2.1: Proposed transitional arrangements for the updated Acceptable Solution G12/AS1 water temperature requirements

Document	Before 3 November 2022	From 3 November 2022 (effective date) To 2 November 2023 (cessation date)
Existing Acceptable Solutions	If used, will be treated as complying with the Building Code	If used, will be treated as complying with the Building Code
Amended Acceptable Solutions	Does not apply to Building Consents issued before this date	If used, will be treated as complying with the Building Code

2.6. Questions for the consultation

2-1 Do you support amending Acceptable Solution G12/AS1 to help reduce the number of hot water scalding injuries in New Zealand, by reducing maximum hot water delivery temperatures for some buildings? The proposed hot water delivery temperatures are:

- 50°C for most buildings
- 45°C for institutions such as schools, hospitals and care homes (no change)
- 40°C for early childhood education centres to align with Ministry of Education requirements.

☐ Yes, these temperatures are about right

☐ No, these temperatures should be even lower

☐ No, the temperatures should remain as is
(status quo at 55°C for most buildings and 45°C for institutions and early childhood education centres)

☐ Not sure/no preference

2-2 What impacts would you expect on you or your business from the proposed options? These impacts may be economic/financial, environmental, health and wellbeing, or other areas.

2-3 Do you agree with the proposed transition time of 12 months for the proposed changes to take effect?

☐ Yes, it is about right

☐ No, it should be longer (24 months or more)

☐ No, it should be shorter (less than 12 months)

☐ Not sure/no preference

3. Protection of potable water

We are proposing to update Acceptable Solution G12/AS1 to improve the requirements to protect potable water from backflow contamination. Backflow occurs when the flow of water within a pipe is reversed, which can draw contaminants into a potable water supply. It can create a health risk to occupants in buildings and to entire public water supply networks. The proposed changes will improve clarity around when backflow prevention is required, what type of backflow prevention devices are suitable and how these devices should be installed and tested.

3.1. Reasons for the change

Backflow occurs when the flow of water within a pipe is reversed, which can draw contaminants into a potable water supply system. It can create a health risk to occupants in buildings and to entire public water supply networks. The Building Code requires that water supply systems are installed in a manner that safeguard people from illness caused by contaminated water and Acceptable Solution G12/AS1 sets out key provisions for protecting potable water from the risk of contamination from backflow.

We have heard from stakeholders in the plumbing industry that there are issues with current backflow prevention measures. Some requirements are unclear, which has led to inconsistencies in application and compliance across the country. At the same time, the government Three Waters Reform Programme is also looking to ensure safe, reliable drinking water is provided to consumers.

We believe that improving the provisions for protecting drinking water supplies from the potential risk of contamination from backflow will give New Zealanders more confidence that water from the tap is safe to drink. We want to hear whether submitters agree that now is the time to make these improvements to the backflow prevention provisions within Acceptable Solution G12/AS1.

3.2. Proposed changes

The proposed changes will improve clarity around when backflow prevention is required, what type of backflow prevention devices are suitable and how these devices should be installed and tested. This includes:

- including additional cross-connection hazard rating examples to provide greater clarity
- introducing containment[8] backflow protection provisions to better align requirements to protect water supplies from contamination from buildings
- strengthening backflow prevention device installation provisions; and
- referencing the latest backflow prevention device testing and manufacturing standards.

Additionally, we are proposing to amend the definition for potable water within G12/AS1 to align with the definition introduced into the Building Act 2004 and Building Code regulations as part of the Water Services Act 2021 coming into force.

The proposed changes are described in Section 3.4. For more details of the proposed wording in Acceptable Solution G12/AS1, please refer to Appendix B.

3.3. Options considered

For this proposal, MBIE considered the following two options against the status quo:

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[8] Containment backflow protection is proposed to be defined in G12/AS1 as "Backflow protection installed adjacent to the point of supply to protect a water main from any potential contamination risk posed by backflow from a premises."

Option 1. Provide guidance regarding appropriate practices for the provision installation of backflow prevention devices

This option considered providing informative guidance around when backflow prevention is required, what type of backflow prevention devices are suitable and how these devices should be installed and tested.

Option 2. Update G12/AS1 Section 3.0 Protection of potable water

This option considered updating G12/AS1 Section 3.0 Protection of potable water to include additional cross-connection hazard rating examples, introduce containment backflow protection provisions, improve backflow prevention device installation requirements and reference the latest testing and manufacturing standards was considered.

3.4. Analysis of the changes

3.4.1. Objectives of the proposal

Following an analysis of the identified issues and consultation with industry parties, option 2 was identified as the most effective option to further reduce the risk of backflow contamination to potable water supplies. This option helps to ensure that requirements under the Building Code continue to support the wider government Three Waters Reform Programme objective of ensuring safe, reliable drinking water supplies.

The objective of these proposed changes is to improve the protection of drinking water from backflow contamination. This contributes to achieving Objective G12.1 (a) and G12.1 (c) (ii) of the Building Code, Functional requirement G12.2 and Performance criteria G12.3.1 and G12.3.2. These clauses of the Building Code state:

Objective

G12.1 The objective of this provision is to–
  (a) safeguard people from illness caused by contaminated water.
  (c) safeguard people from loss of amenity arising from–
    (ii) water for human consumption, which is offensive in appearance, odour or taste.

Functional requirement

G12.2 Buildings provided with water outlets, sanitary fixtures or sanitary appliances must have safe and adequate water supplies.

Performance

G12.3.1 Water intended for human consumption, food preparation, utensil washing or oral hygiene must be potable.

G12.3.2 A potable water supply system shall be–
(a) protected from contamination; and
(b) installed in a manner which avoids the likelihood of contamination within the system and the water main; and
(c) installed using components that will not contaminate the water.

3.4.2. Additional cross-connection hazard rating examples

G12/AS1 Paragraph 3.3 describes three cross connection hazard rating categories (High, Medium and Low) and provides examples of various building systems which fall into each category. The current example lists have not been updated for 20 years and additional examples are to provide clarity regarding the cross-connection hazard ratings that should be applied to potable water supplies to these contemporary building systems. MBIE reviewed the existing requirements and identified additional examples of cross connections hazards. The additional examples proposed to include in G12/AS1 include:

High Hazard

- Bidets and douche seats
- Handheld bidet hoses and WC trigger sprays
- Connections for portable and mobile tankers
- Healthcare waste disposal equipment

Medium Hazard

- Treated grey water
- Note 1: For carbonated drink dispensers, the pipework material installed downstream of the backflow prevention device shall not be made of copper and not be affected by carbon dioxide gas.

Low Hazard

- Drinking fountains and bottle fillers
- Rainwater tanks and supply systems (see Note 2)
- External hose taps, with no hazards within 18 metres
- Emergency eye wash and shower stations
- Note 2: Air gap separation is the recommended type of backflow prevention for a rainwater tank with a potable water supply connection.

3.4.3. Backflow protection for public water supplies

The current backflow protection requirements within G12/AS1 focus on the provision of appropriate backflow prevention devices as near as practicable to any potential source of contamination within buildings.

Additional containment backflow protection[9] provisions are proposed to be introduced into Acceptable Solution G12/AS1. This proposed change includes the introduction of requirements for containment backflow prevention to be provided for new buildings that pose a heightened risk of water supply contamination if a cross connection was to occur. This will provide additional protection to public water supplies from premises such as those which process or manufacture toxic chemicals and those which process human or animal biological or faecal matter.

Existing containment backflow prevention requirements are being applied inconsistently across New Zealand and in 2021, were transferred from Health Act 1956 into the Water Services Act 2021. These existing requirements place responsibility on drinking water suppliers to protect drinking water supplies against the risk of backflow.

This proposed change will ensure those constructing new buildings that pose a heightened risk of water supply contamination provide containment backflow protection to comply with the Building Code. This will not impact the ability for water suppliers to install containment backflow prevention devices upstream of the point of supply to a premises where they have determined there is a risk of backflow into the drinking water supply.

Containment backflow prevention devices installed to comply with the Building Code need to be installed by an authorised plumber. They also need to be included on a buildings compliance schedule and tested annually by an independently qualified person as part of the process for issuing an annual building warrant of fitness.

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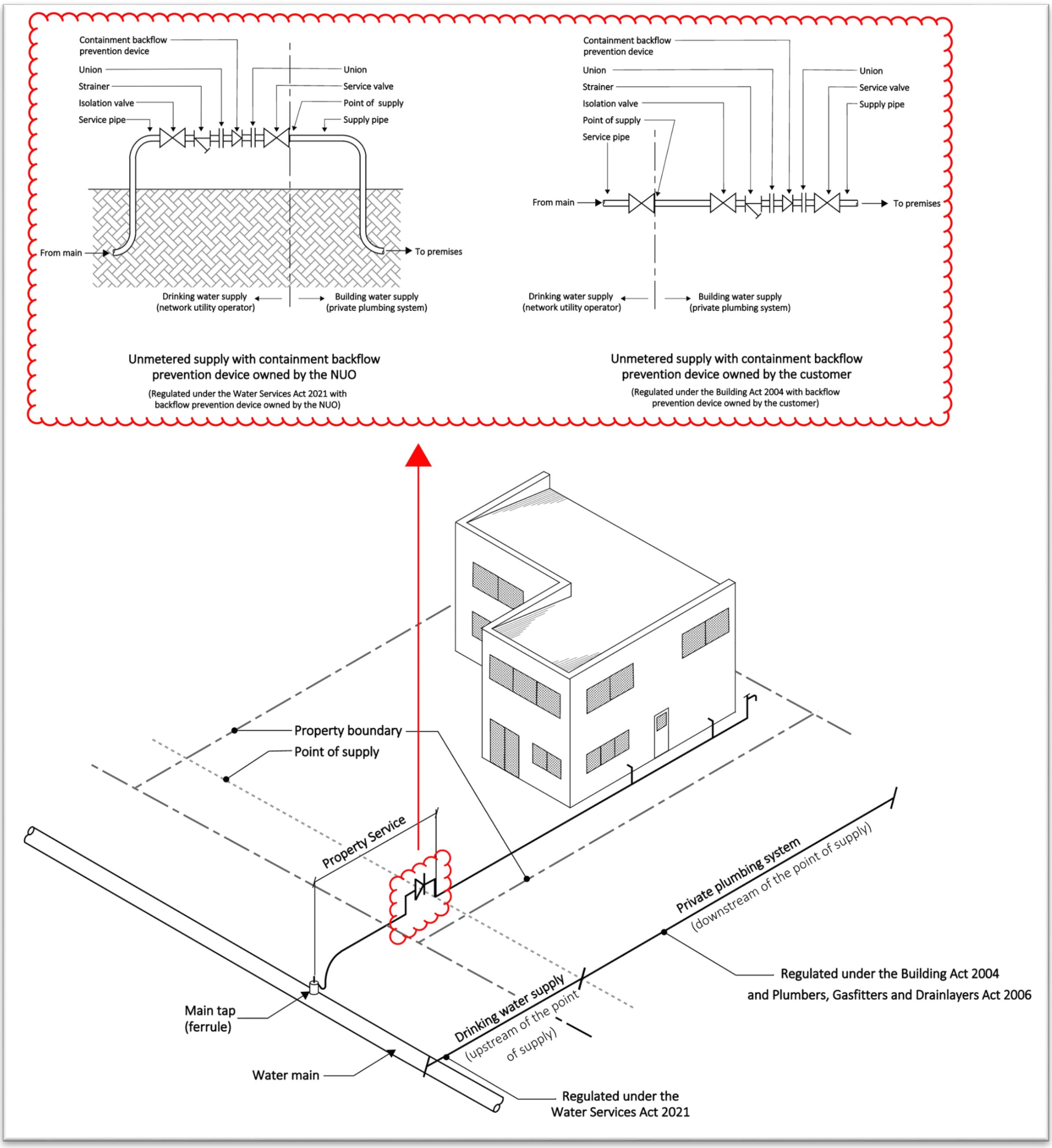
[9] Containment backflow protection is proposed to be defined in G12/AS1 as “Backflow protection installed adjacent to the point of supply to protect a water main from any potential contamination risk posed by backflow from a premises.”

FIGURE 3.1: Example of containment backflow protection



3.4.4. Backflow prevention device installation

These proposed changes relate to the provisions for the installation of backflow prevention devices within G12/AS1 that are not in line with industry practice.

The proposed backflow prevention device installation changes are intended to clarify that:

- Integral backflow prevention devices appropriate for the relevant cross-connection hazard are acceptable.
- Backflow prevention devices must be fitted with mechanical unions on the inlet and outlet of the valve to allow for the removal of the valve for replacement.
- Backflow prevention devices need to be installed with isolation valves in order allow independently qualified persons to test these devices annually.

- Backflow prevention devices installed within buildings need to have adequate drainage provisions to accommodate both intermittent and full flow rate discharge to prevent water damage to building elements in the event a relief valve fully opens.
- Backflow prevention devices need to be adequately supported to prevent damage to the connecting pipework.
- Providing guidance around what constitutes an accessible position for backflow prevention devices to be installed. This clarification is proposed to reduce the likelihood of devices being installed in locations that may compromise the health and safety of the independently qualified persons who are required to test these devices annually.

3.4.5. Backflow prevention device testing and manufacturing standards

Standards and documents for backflow prevention device testing and manufacturing cited within G12/AS1 are out of date. We are proposing to cite the updated versions of:

- AS/NZS 2845.3:2020 Water supply – Backflow prevention devices – Field testing and maintenance of testable devices
- Water New Zealand and Master Plumbers, Gasfitters and Drainlayers NZ Inc, NZ Backflow testing standard 2019, Field testing of backflow prevention devices and verification of air gaps.

This standard and document has been reviewed against the criteria outlined in the MBIE Operating Protocol - Referencing standards in the Building Code system[10]. No significant issues were identified that would prohibit them from being cited in the acceptable solutions and verification methods.

3.4.6. Identification of water supply pipework

Water supply pipework systems need to be clearly identifiable to reduce the risk of plumbers misidentifying pipework. The misidentification of pipework can lead to potential cross-connections between a potable and non-potable water services, which can result in water supply contamination and subsequent health risks.

G12/AS1 Paragraph 4.3.1 currently references the standard NZS 5807:1980 as the means of identifying potable and non-potable pipelines within buildings. NZS 5807 is no longer considered to provide sufficient clarity regarding identification requirements for non-potable water supply pipework within buildings to reduce the risk of cross connections occurring. It is proposed to amend G12/AS1 to clarify that potable and non-potable water supply pipework within buildings should be identified in accordance with AS/NZS 3500 Part 1 to reduce the risk of cross connection and subsequent water supply contamination.

3.4.7. AS/NZS 3500 Part 1 Section 4 Cross-connection control and backflow prevention

The backflow prevention provisions within AS/NZS 3500.1: 2021 Section 4 are proposed to be cited as an Acceptable Solution within G12/AS3. For further information on the proposed changes to the citation of the 2021 AS/NZS 3500 Plumbing and drainage standards, please refer to proposal 4.

3.4.8. Definition of potable water

The definition of ‘potable water’ is proposed to be amended and a definition for ‘drinking water standards’ added within the Definitions for G12/VM1 & AS1/AS2/AS3 in order to align with the definitions inserted by the Water Services Act 2021 into the Building Act 2004 s7 Interpretation, and Building Regulations 1992 Schedule 1 Building Code Clause A2 Interpretation.

3.4.9. Impacts of the changes

The costs and benefits of the changes were assessed qualitatively. MBIE expects the proposed changes will help ensure the backflow prevention provisions within the acceptable solutions for Building Code clause G12 continue to ensure that plumbing systems are installed in a manner which avoid the likelihood of contamination within building water supply systems and public water mains to ensure public health is protected.

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[10] Referencing standards in the Building Code system

The proposed changes will provide more consistent and standardised approaches for the provision of backflow prevention. This will help create a more efficient design review process for building consent applications.

Information and education will be required to ensure plumbers, independently qualified persons who test backflow prevention devices, and building consent officers are aware of any changes to the backflow prevention provisions within the acceptable solutions for Building Code clause G12, and to help them understand what this means for them.

In consideration of these impacts, the benefits of the change exceed the costs.

It is expected that these proposed changes will:

- Make it easier to determine appropriate cross-connection hazard ratings
- Improve clarity around when containment backflow prevention is required for a premises and what type of backflow prevention device is suitable
- Complement previous requirements under the Health Act and support proposed new requirements for protecting water supplies being introduced by Taumata Arowai
- Strengthening backflow prevention device installation requirements
- Ensure the use of the latest backflow prevention device testing and manufacturing standards are deemed to comply with the Building Code.

3.5. Transitions

Effective date: 4 November 2022

Transitional arrangements: 12 months

It is proposed that the existing Acceptable Solutions and Verification Methods will remain in force, as if not amended, for a period of 12 months until 2 November 2023 (the proposed cessation date) as described in TABLE 3.1.

TABLE 3.1: Proposed transitional arrangements for the protection of potable water

Document	Before 3 November 2022	From 3 November 2022 (effective date) To 2 November 2023 (cessation date)
Existing Acceptable Solution G12/AS1 Amendment 12	If used, will be treated as complying with the Building Code	If used, will be treated as complying with the Building Code
Amended Acceptable Solution G12/AS1	Does not apply to Building Consents issued before this date	If used, will be treated as complying with the Building Code

3.6. Questions for the consultation

3-1 Do you support the proposed amendments to Acceptable Solution G12/AS1 for the protection of potable water?

3-2 What impacts would you expect on you or your business from the proposed options?
These impacts may be economic/financial, environmental, health and wellbeing, or other areas.

3-3 Do you agree with the proposed transition time of 12 months for the proposed changes to take effect?

☐ Yes, it is about right
☐ No, it should be longer (24 months or more)
☐ No, it should be shorter (less than 12 months)
☐ Not sure/no preference

4. AS/NZS 3500 Plumbing and drainage standards

We are proposing to cite the 2021 editions of the AS/NZS 3500 Plumbing and drainage standards as acceptable solutions for complying with Building Code clauses E1 Surface Water, G12 Water Supplies and G13 Foul Water. This follows a three-year revision project to improve these standards. These standards play an integral part in setting out design and installation requirements for plumbing and drainage systems in New Zealand. We are also proposing to cite AS/NZS 3500:2021 Part 1 and Part 4 under a new Acceptable Solution G12/AS3, which will provide consistency between the status of these standards under the Building Code.

4.1. Reasons for the change

The AS/NZS 3500 Plumbing and Drainage standards have been cited within the Building Code system since its inception in 1992. These standards contribute significantly to supporting the Building Code system[11] and are currently cited as Acceptable Solutions and Verification Methods for multiple Building Code clauses.

The publication of the 2021 editions of the AS/NZS 3500 series follows a three-year revision project to improve these standards. These standards play an integral part in setting out design and installation requirements for plumbing and drainage systems in New Zealand. They also support the Trans-Tasman Mutual Recognition Arrangement which allows plumbers and drainlayers who are registered in New Zealand to practise in Australia, and vice versa.

MBIE have invested considerable time and resource into the development of the AS/NZS 3500 series of plumbing and drainage standards as part of the technical committee. As such, it is now possible to remove a number of the citation modifications made to AS/NZS 3500 that were previously required for compliance with the Building Code.

4.2. Proposed changes

We are proposing to cite the 2021 editions of the AS/NZS 3500 Plumbing and drainage standards as Acceptable Solutions for complying with Building Code clauses E1 Surface Water, G12 Water Supplies and G13 Foul Water. This includes proposed changes to:

- Acceptable Solutions E1/AS2
  - Cite the new AS/NZS 3500.3: 2021 Plumbing and drainage – Stormwater drainage and remove a number of modifications previously found in E1/AS2.
- Acceptable Solution G12/AS3
  - Issue the new Acceptable Solution G12/AS3 to cite AS/NZS 3500.1: 2021 Plumbing and drainage – Water Services and AS/NZS 3500.4: 2021 Plumbing and drainage – Heated water services.
- Acceptable Solutions G13/AS3
  - Cite the new AS/NZS 3500.2: 2021 Plumbing and drainage – Sanitary plumbing and drainage Amendment 1 and remove a number of modifications previously found in G13/AS3.

As part of this year's update, we are also proposing to introduce a method for calculating design flow rates for use in sizing water services for multiple types of buildings into Verification Method G12/VM1, which currently cites AS/NZS 3500.1 and .4. Details of this proposed change are provided in Proposal 5.

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[11] Please refer to the MBIE Operating Protocol "Tier framework to support standards in the Building Code system" for the assessment of importance of standards. This framework was consulted on publicly in 2021 and is available online at building.govt.nz.

Proposal 4. AS/NZS 3500 Plumbing and drainage standards

For more details of the proposed changes to the documents, please refer to:

- Appendix A for the proposed citation of AS/NZS 3500.3:2021 in Acceptable Solution E1/AS2 for stormwater drainage systems
- Appendix B for the proposed citation of AS/NZS 3500.1:2021 and AS/NZS 3500.4:2021 in a new Acceptable Solution G12/AS3 for cold and heated water services
- Appendix C for the proposed citation of AS/NZS 3500.2:2021 in Acceptable Solution G13/AS3 for sanitary plumbing and drainage systems

FIGURE 4.1: AS/NZS 3500: 2021 Plumbing and drainage standards

4.3. Options considered

For this proposal, MBIE considered the following three options against the status quo:

Option 1: Insert the applicable requirements directly into the acceptable solutions and verification methods
This option was not considered to be reasonable as the material is too large and impractical for direct publication in the acceptable solutions and verification methods.

Option 2: Identify alternative standards and reference those documents instead
This option was not considered to be reasonable as no alternative standards were identified that were specific to the New Zealand context.

Option 3: Revise the references and citations to reflect the newest versions of the published version (recommended) – This option is recommended in order to maintain up-to-date information and to reduce confusion and disconnect between industry practice and compliance with the Building Code. This also aligns with our strategic direction to support the development of these standards for compliance with the Building Code.

4.4. Analysis of the proposed changes

4.4.1. Objectives of the proposal

The objective of this change is to reference up-to-date standards for designing and installing plumbing and drainage systems within the Building Code compliance pathways and remove New Zealand specific modifications within the existing acceptable solutions. This contributes to achieving the Building Code objectives for E1 Surface Water, G12 Water Supplies, and G13 Foul Water and their associated function requirements and performance criteria. The objectives of these clauses state:

Objective

E1.1 The objective of this provision is to–
  (a) safeguard people from injury or illness, and other property from damage, caused by surface water, and
  (b) Protect the outfalls of drainage systems.

G12.1 The objective of this provision is to–
  (a) safeguard people from illness caused by contaminated water
  (b) safeguard people from injury caused by hot water system explosion, or from contact with excessively hot water:
  (c) safeguard people from loss of amenity arising from–
    (i) a lack of hot water for personal hygiene; or
    (ii) water for human consumption, which is offensive in appearance, odour or taste
  (d) ensure that people with disabilities are able to carry out normal activities and functions within buildings.

G13.1 The objective of this provision is to:
  (a) Safeguard people from illness due to infection or contamination resulting from personal hygiene activities; and
  (b) Safeguard people from loss of amenity due to the presence of unpleasant odours or the accumulation of offensive matter resulting from foul water disposal.

4.4.2. Significant changes to the AS/NZS 3500 standards

Significant changes within the AS/NZS 3500:2021 Plumbing and drainage series include:

- The removal of specific product standard conformance requirements to avoid inconsistencies with the WaterMark scheme and the NZ Building Code.
- Relocation of definitions into AS/NZS 3500: 2021 Part 0 Glossary of terms for consistency across the series.
- Removal of cross-connection hazards and corresponding hazard ratings to avoid conflict between the Plumbing Code of Australia and New Zealand Building Code Acceptable Solution G12/AS1.
- Jointing requirements for plastics pipes have been clarified and expanded to allow different methods.
- Changes to the requirements for the marking of pipes in commercial buildings to assist in better identification of pipework and avoid cross connections.
- Changes to the requirements for the installation of water services located in metal-framed walls.
- Changes to the connection requirements for sanitary drains at grade.
- The range of materials that can be used for wet wells has been expanded to encompass prefabricated wells.
- Design rainfall intensities for stormwater drainage systems are now expressed in terms of the Annual Exceedance Probability (AEP)[12] values to reflect the practice of the Australian Bureau of Meteorology (BOM) and align with the performance requirements of Building Code clause E1 Surface water.
- Design rainfall intensities for stormwater drainage systems have been updated to show the latest values from the Australian Bureau of Meteorology (BOM) and New Zealand's National Institute of Water and Atmospheric Research (NIWA).

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[12] The Annual Exceedance Probability (AEP) is the probability that a given total quantity of rainfall, accumulated over a given duration, will be exceeded in any one year, and is expressed as a percentage.

- New Zealand rainfall maps have been replaced by Table E.1 showing 10 % AEP (10 years ARI) and 2 % AEP (50 years ARI) rainfall intensities for selected locations.
- The minimum separation distance between above-ground heated water services and electrical services has been reduced to align with the AS/NZS 3000 Wiring rules and AS/NZS 3500.1.
- Changes have been made to requirements for circulated heated water systems including water meters and entry points for heated water, thermal insulation for non-circulatory heated water piping, and maximum capacities of any dead leg from the branch offtake to its termination - to improve the amenity for users and reduce wastage of water and energy.
- Heated water temperature control provisions relating to maximum sanitary fixture delivery temperatures and solutions for control of delivery temperatures have been deleted to avoid conflict between the Plumbing Code of Australia and New Zealand Building Code Acceptable Solution G12/AS1.

The proposed AS/NZS 3500: 2021 standards have been reviewed against the criteria outlined in the MBIE Operating Protocol - Referencing standards in the Building Code system[13]. No significant issues were identified that would prohibit them from being cited in the acceptable solutions and verification methods.

Additionally, a number of modifications to the standards previously found in the acceptable solutions are proposed to be removed. These modifications are no longer necessary for the proposed citation of AS/NZS 3500: 2021 as these have been incorporated into the standard through MBIEs involvement in the standards committee. The appendices for this consultation document detail the modifications to be removed from the acceptable solutions

4.4.3. Impacts of the changes

Costs and benefits of the changes were assessed qualitatively. Along with issuing the new Acceptable Solution G12/AS3, MBIE expects the following from citing these new standards:

- The changes to the standards builds upon knowledge from both sides of the Tasman and reflects the most up-to-date information for designing and installing plumbing and drainage systems. This will assist with achieving the objectives for Building Code clauses E1, G12 and G13.
- Incorporating New Zealand specific modifications directly into the standards will make demonstrating compliance with the Building Code easier and less confusing for users and building consent authorities.
- Issuing the new Acceptable Solution G12/AS3 will provide a more consistent approach for what material is suitable for publishing as a verification method versus an acceptable solution.
- The technical changes within the 2021 editions of the AS/NZS 3500 standards are not anticipated to result in material increases to the cost of constructing plumbing and drainage systems.
- Users will be required to access the updated standards and incorporate these into existing practices. However, the cost in access is minimal as most users of these standards have access to AS/NZS 3500 series through existing subscriptions, such as those provided by the Plumbers, Gasfitters and Drainlayers Boards, Master Plumbers or employers.

In this case, MBIE considers the benefits of the change exceed the minimal costs.

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[13] Referencing standards in the Building Code system

4.5. Transitions

Effective date: 4 November 2022

Transitional arrangements: 12 months

It is proposed that the existing Acceptable Solutions and Verification Method will remain in force, as if not amended, for a period of 12 months until 3 November 2023 (the proposed cessation date) as described in TABLE 4.1.

TABLE 4.1: Proposed transitional arrangements for the protection of potable water

Document	Before 3 November 2022	From 3 November 2022 (effective date) To 2 November 2023 (cessation date)
Existing Acceptable Solutions and Verification Method	If used, will be treated as complying with the Building Code	If used, will be treated as complying with the Building Code
Amended Acceptable Solutions and Verification Method	Does not apply to Building Consents issued before this date	If used, will be treated as complying with the Building Code

4.6. Questions for the consultation

4-1. Do you support amending the Acceptable Solutions for E1, G12, and G13 to cite the following AS/NZS 3500: 2021 Plumbing and drainage standards as proposed?

- AS/NZS 3500.1: 2021 – Water Services
- AS/NZS 3500.2: 2021 – Sanitary plumbing and drainage
- AS/NZS 3500.3: 2021 – Stormwater drainage
- AS/NZS 3500.4: 2021 – Heated Water Systems.

4-2. Do you support issuing the new Acceptable Solution G12/AS3 as proposed to cite AS/NZS 3500.1: 2021 – Water services and AS/NZS 3500.4: 2021 – Heated water services?

4-3. Are there any additional modifications to the referencing of the AS/NZS 3500: 2021 Plumbing and drainage standards that we should consider?
If there are modifications that you think should be included, please tell us.

4-4. What impacts would you expect on you or your business from the proposed options?
These impacts may be economic/financial, environmental, health and wellbeing, or other areas.

4-5. Do you agree with the proposed transition time of 12 months for the proposed changes to take effect?

☐ Yes, it is about right

☐ No, it should be longer (24 months or more)

☐ No, it should be shorter (less than 12 months)

☐ Not sure/no preference

5. Water supply system components

We are proposing 12 improvements within Acceptable Solution G12/AS1 to fill in gaps in this compliance pathway, address issues raised by building consent authorities and industry bodies, and to provide more ways for building water supply systems to comply with the Building Code.

We are also proposing to introduce a 'deemed to comply' pathway for use by plumbing system designers to calculate the design flow rates for sizing water supply pipework in multiple types of buildings within Verification Method G12/VM1.

5.1. Proposed changes

As part of ongoing maintenance of the Building Code compliance pathways, we are proposing 12 improvements to Acceptable Solution G12/AS1 to fill in gaps in this compliance pathway for plumbing system components. The changes proposed include amendments to the provisions in Acceptable Solution G12/AS1 for:

- Expansion vessels
- Seismic restraint of water heaters
- Accessible taps
- Wet-back water heaters
- UV resistant pipework insulation material
- Cleaning and disinfection of water storage tanks
- Water supply pipework installation standards
- Minimum and maximum water pressures
- Relief valve drain discharge locations and tundish drain sizing
- Minimum pipework cover below ground
- Flushing of water supply systems
- Unintentional heating of cold water.

We are also proposing to introduce a compliance pathway for use by plumbing system designers to calculate the design flow rates for sizing water supply pipework in multiple types of buildings within Verification Method G12/VM1.

The issues with these components have previously been raised by plumbing and drainage industry bodies and as items that needed clarification to align with existing design practices. The sections below outline each reason for change, options considered and analysis of the changes. These proposed changes all contribute to achieving Objective G12.1 of the Building Code and Functional requirement G12.2 of the Building Code. The specific performance criteria for each change are provided in the analysis section.

For more specific details on the proposed wording for each change and portions of G12/AS1 and G12/VM1 affected by the proposal, please refer to Appendix B.

5.2. Analysis of the changes

5.2.1. Expansion vessels as an option for managing thermal expansion within storage water heating systems

Cold water expands when it is heated. Because storage water heating systems are fitted with a non-return valve on the cold-water supply to prevent this expansion forcing water back into the supply, there needs to be some other mechanism in the system to prevent water heaters or other components from rupturing. This is required to achieve the Building Code Performance Criteria G12.3.8 which states:

Proposal 5. Water supply system components

Performance

G12.3.8 Vessels used for producing or storing hot water must be provided with safety devices that–

(a) relieve excessive pressure during both normal and abnormal conditions; and

(b) limit temperatures to avoid the likelihood of flash steam production in the event of rupture.

Currently, the Acceptable Solution G12/AS1 provides only one solution for this through the provision of an expansion control valve. These valves regularly discharge treated drinking water during the course of normal operations, which is not always the desired design solution.

To provide additional means for compliance, MBIE considered additional options for managing thermal expansion during the normal operation of storage water heating systems. It was identified that expansion vessels were commonly used in other countries to safely manage thermal expansion within storage water heating systems and MBIE commissioned research to determine their suitability for use in New Zealand.

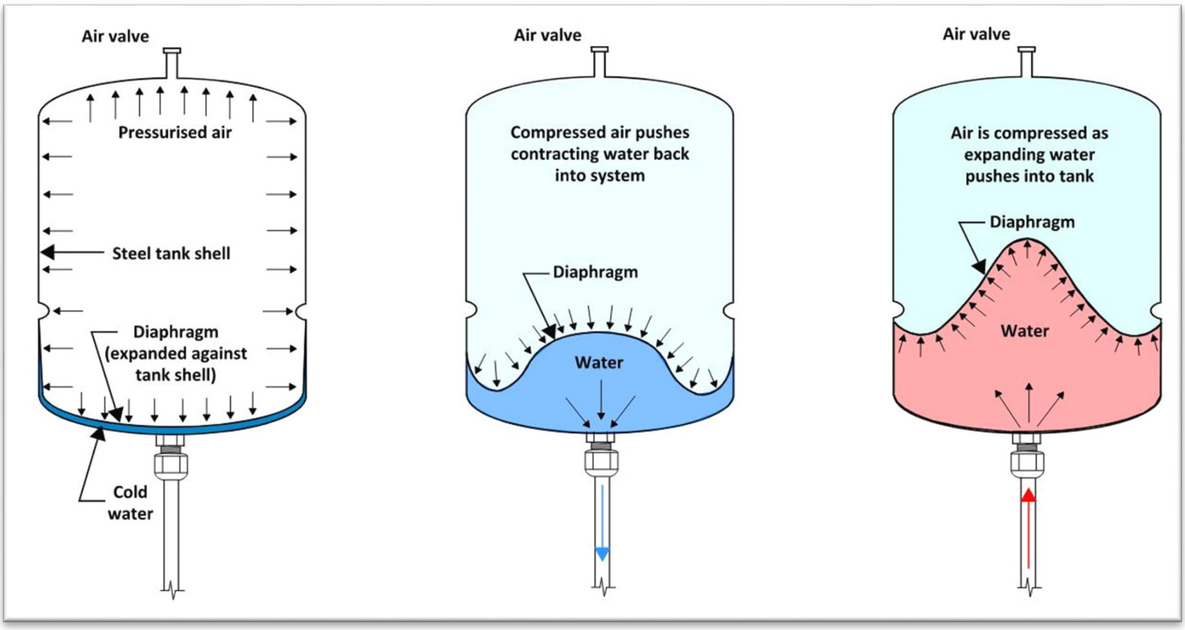
The proposed change would permit the use of expansion vessels as an alternative option to expansion control valves for mains pressure storage water heating systems complying with G12/AS1. Low pressure valve vented storage water heating systems are proposed to be excluded, as these would typically require an excessively large and impractical expansion vessel to accommodate pressure increases in the system.

The costs and benefits of the change were assessed qualitatively. MBIE expects the following from this change:

- Expansion vessels will provide a low-cost, simple-to-install alternative to expansion control valves and meet the applicable Building Code performance criteria for mains pressure systems.
- Expansion vessels are able to manage the effects of thermal expansion within a storage water heating system without discharging treated drinking water down the drain. This will reduce the amount of water used by the system.
- Expansion vessels also help stabilise pressures within hot water systems. This can potentially help to improve the durability and lifespan of storage water heating system components.

No significant impact or costs have been identified for the use of expansion vessels as an alternative to expansion control valves. In this case, the benefits of the change exceed the costs.

FIGURE 5.1: Example of expansion vessel operation



5.2.2. Seismic restraint of water heaters

Storage water heaters need to be restrained to prevent movement in the event of an earthquake. The current detail for seismically restraining storage water heaters in G12/AS1 (Figure 14) requires straps to be provided no further than 100mm from the top and bottom of a storage water heater. This can result in the straps clashing with the pipework connections and cylinder controls. We have heard from the plumbing industry that more flexibility is required in this detail so that straps can be located in positions where they do not clash with other critical cylinder features.

G12/AS1 Figure 14 is proposed to be updated to provide alternative options for seismic restraint straps to be located in positions where they do not clash with other critical cylinder features. This will assist in achieving the Building Code Performance Criteria G12.3.7 (c) and B1.3.3 (f) which state:

Performance

G12.3.7 Water supply systems must be installed in a manner that–

(c) allows reasonable access to components likely to need maintenance.

B1.3.3 Account shall be taken of all physical conditions likely to affect the stability of buildings, building elements and sitework, including:

(f) earthquake.

No significant impact or costs have been identified for this change and the benefits of the change exceed the costs.

5.2.3. Accessible taps

Currently only lever or capstan handle taps are permitted to be installed where they are likely to be used by people with disabilities when complying with Acceptable Solution G12/AS1. There are now more modern tapware options available which incorporate sensor plates that activate taps automatically when hands are placed under them. Sensor taps are particularly suitable for use by people with disabilities, particularly where a person may have limited hand function. Capstan handle taps are also no longer installed in facilities for use by people with disabilities and have subsequently been removed as an acceptable option from recent accessible design standard revisions.

It is proposed to amend G12/AS1 to clarify requirements for taps with single lever handles and to allow the provision of sensor activated taps. This will assist in achieving the Building Code Performance Criteria G12.3.10 which states:

Performance

G12.3.10 Water supply taps must be accessible and usable for people with disabilities.

No significant impact or costs have been identified for this change as this provides more options and the benefits of the change exceed the costs.

5.2.4. Wetback water heaters

Wetback water heating systems utilise heat generated from a solid fuel heater to heat water for domestic use. G12/AS1 currently provides a limited amount of information regarding wetback water heating systems and additional detail is required to ensure these systems are installed safely. G12/AS1 is proposed to be amended to cite Part 4 of NZS 4603 Installation of low-pressure thermal storage electric water heaters with copper cylinders (open-vented systems). This standard provides more comprehensive provisions for designing and installing wetback water heating systems utilising natural circulation. Access to view and print NZS 4603 is currently sponsored by MBIE.

It is proposed to amend G12/AS1 to cite the design and installation provisions for wetback water heaters within NZS 4603 Part 4. This will assist in achieving the Building Code Performance Criteria G12.3.8 which states:

Performance

G12.3.8 Vessels used for producing or storing hot water must be provided with safety devices that–

(a) relieve excessive pressure during both normal and abnormal conditions; and

(b) limit temperatures to avoid the likelihood of flash steam production in the event of rupture.

No significant impact or costs have been identified for this change and the benefits of the change exceed the costs.

5.2.5. UV resistant pipework insulation material

Water supply pipework installed external to the building envelope needs to be insulated to reduce the risk of freezing in frost prone areas. Hot water pipework is also commonly insulated where installed external to the building envelope to comply with the Building Codes energy efficiency requirements.

When pipework insulation is installed external to the building envelope and exposed to direct sunlight, it needs to be resistant to, or suitably protected from UV exposure. This ensures that pipework insulation installed external to the building envelope will meet minimum durability requirements and continue to satisfy the other objectives of the Building Code. This also supports maximising the insulation's life expectancy and reducing the costs for building owners.

It is proposed to amend G12/AS1 to specify that pipework insulation material exposed to direct sunlight shall be UV resistant or suitably protected to withstand the degradation that can be caused by exposure to ultraviolet light.

Performance

B2.3.1 Building elements must, with only normal maintenance, continue to satisfy the performance requirements of this code for the lesser of the specified intended life of the building:

(c) 5 years if stated, or:

(i) The building elements (including services, linings, renewable protective coatings, and fixtures) are easy to access and replace, and

(ii) Failure of those building elements to comply with the building code would be easily detected during normal use of the building.

B2.3.2 Individual building elements which are components of a building system and are difficult to access or replace must either:

(a) All have the same durability, or

(b) Be installed in a manner that permits the replacement of building elements of lesser durability without removing building elements that have greater durability and are not specifically designed for removal and replacement.

G12.3.7 Water supply systems must be installed in a manner that:

(a) pipes water to sanitary fixtures and sanitary appliances flow rates that are adequate for the correct functioning of those fixtures and appliances under normal conditions; and

(b) avoids the likelihood of leakage; and

(c) allows reasonable access to components likely to need maintenance.

H1.3.4 Systems for the heating, storage, or distribution of hot water to and from sanitary fixtures or sanitary appliances must, having regard to the energy source used:

(a) limit the energy lost in the heating process; and

(b) be constructed to limit heat losses from storage vessels and from distribution systems; and

(c) be constructed to facilitate the efficient use of hot water.

No significant impact or costs have been identified for this change and the benefits of the change exceed the costs.

5.2.6. Cleaning and disinfection of water storage tanks

Potable water storage tanks may become contaminated during installation or repair from the feet or boots of workers, or from sedimented materials. It is proposed to amend G12/AS1 to cross-reference the requirements for the cleaning and disinfection of potable water storage tanks within AS/NZS 3500.1:2021 Appendix G. Additionally, an informative comment is proposed for inclusion to cross-reference acceptable water storage tank overflow pipe discharge locations within AS/NZS 3500.1:2021 clause 8.4.4.2. This will help ensure water supplied from tanks is safe to drink and will assist in achieving the Building Code Performance Criteria G12.3.1 and G12.3.2 which states:

Performance

G12.3.1 Water intended for human consumption, food preparation, utensil washing or oral hygiene must be potable.

G12.3.2 A potable water supply system shall be–

(a) protected from contamination; and

(b) installed in a manner which avoids the likelihood of contamination within the system and the water main; and

(c) installed using components that will not contaminate the water.

No significant impact or costs have been identified for this change and the benefits of the change exceed the costs.

5.2.7. Minimum and maximum water pressures at sanitary fixtures and appliances

Inadequate water pressure can lead to plumbing fixtures and appliances not functioning adequately and excessive water pressure can shorten the life of appliances and damage plumbing fixtures, leading to leaks and pipe bursts. Additionally, excessive water pressure can result in excessive water use.

To assist with ensuring that building water supplies are not installed with inadequate or excessive water pressures, minimum and maximum water pressure requirements are proposed to be introduced within G12/AS1. This contributes to achieving compliance with Performance Criteria G12.3.7 (a) which states:

Performance

G12.3.7 Water supply systems must be installed in a manner that:

(a) pipes water to sanitary fixtures and sanitary appliances flow rates that are adequate for the correct functioning of those fixtures and appliances under normal conditions; and

(b) avoids the likelihood of leakage

No significant impact or costs have been identified for this change and the benefits of the change exceed the costs.

5.2.8. Water supply pipework installation standards

Building water supply systems can be constructed from various types of materials, and each pipework system material has its own unique installation requirements.

To assist plumbers with ensuring that water systems are installed correctly, it is proposed to amend G12/AS1 to cite suitable installation standards for U-PVC, copper and polyethylene pipework. This contributes to achieving compliance with Performance Criteria G12.3.7 which states:

Performance

G12.3.7 Water supply systems must be installed in a manner that:

(a) pipes water to sanitary fixtures and sanitary appliances flow rates that are adequate for the correct functioning of those fixtures and appliances under normal conditions; and

(b) avoids the likelihood of leakage; and

(c) allows reasonable access to components likely to need maintenance.

No significant impact or costs have been identified for this change and the benefits of the change exceed the costs.

5.2.9. Unintentional heating of cold water

Cold water within plumbing systems can become unintentionally heated if, for example, cold water supply pipework is run directly under a metal roof. There are potential health risks involved if cold water becomes unintentionally heated, including the risk of legionella bacteria growth or scalding.

G12/AS1 is proposed to be amended to require water supply systems to be installed in a manner that avoids the unintentional heating of cold water. This contributes to achieving the Building Code Performance Criteria G12.3.2 and G12.3.3 which state:

Performance

G12.3.2 A potable water supply system shall be–
(a) protected from contamination; and
(b) installed in a manner which avoids the likelihood of contamination within the system and the water main; and
(c) installed using components that will not contaminate the water.

G12.3.3 A non-potable water supply system used for personal hygiene shall be installed in a manner that avoids the likelihood of illness or injury being caused by the system.

No significant impact or costs have been identified for this change and the benefits of the change exceed the costs.

5.2.10. Relief valve drain discharge locations and tundish drain sizing

Storage water heater relief valves require drains to convey water to an appropriate location when valves open. G12/AS1 is proposed to be amended to provide examples of acceptable relief valve drain discharge locations and provide additional information regarding the sizing of relief valve tundish drains. This contributes to achieving the Building Code Performance Criteria G12.3.8 which states:

Performance

G12.3.8 Vessels used for producing or storing hot water must be provided with safety devices that–
(a) relieve excessive pressure during both normal and abnormal conditions; and
(b) limit temperatures to avoid the likelihood of flash steam production in the event of rupture.

No significant impact or costs have been identified for this change and the benefits of the change exceed the costs.

5.2.11. Minimum pipework cover below ground level for non-trafficable areas

Water supply pipework installed below ground needs to be deep enough to ensure it is adequately protected from accidental damage. G12/AS1 is proposed to be amended to reduce the minimum cover of water supply pipes below gardens, lawns, paths paving for pedestrian use or other areas not subjected to vehicular traffic from 450 mm to 300 mm. This will align the minimum pipework cover requirements for non-trafficable areas in G12/AS1 with equivalent provisions for water supply pipework in AS/NZS 3500.1 and with minimum cover requirements for consumer gas piping in AS/NZS 5601.1. This contributes to achieving the Building Code Performance Criteria G12.3.7 which states:

Performance

G12.3.7 Water supply systems must be installed in a manner that–
(b) avoids the likelihood of leakage, and
(c) allows reasonable access to components likely to need maintenance.

No significant impact or costs have been identified for this change and the benefits of the change exceed the costs.

5.2.12. Flushing of water supply systems on completion of construction

Flushing water supply pipework after installation or alteration is needed to clear the system of any dirt, swarf or other debris which may interfere with system components or contaminate the water. G12/AS1 is proposed to be amended to require newly installed and altered water supply systems to be flushed at each discharge point to remove any dirty water or debris on completion of construction. This contributes to achieving the Building Code Performance Criteria G12.3.1 and G12.3.2 which states:

Performance

G12.3.1 Water intended for human consumption, food preparation, utensil washing or oral hygiene must be potable.

G12.3.2 A potable water supply system shall be–

(a) protected from contamination; and

(b) installed in a manner which avoids the likelihood of contamination within the system and the water main; and

(c) installed using components that will not contaminate the water.

No significant impact or costs have been identified for this change and the benefits of the change exceed the costs

5.2.13. Water pipe sizing calculation method

Verification Method G12/VM1 currently contains a design method for water supply systems that cites the AS/NZS 3500.1 and AS/NZS 3500.4 standards. The method for sizing of water supply pipework within these standards is limited in its scope of application, being restricted to residential buildings only. It is also based on historical data when flow rates were higher and usage patterns were very different. Research[14] has found that these methods can result in an over-estimation of the design flow when used to design the domestic water systems for various types of buildings.

To assist with demonstrating compliance for other types of buildings, it is desired to provide a more comprehensive verification method to support the sizing of water supply pipework for buildings within G12/VM1. This contributes to achieving compliance with Performance Criteria G12.3.7 (a) which states:

Performance

G12.3.7 Water supply systems must be installed in a manner that–

(a) pipes water to sanitary fixtures and sanitary appliances with flow rates that are adequate for the correct functioning of those fixtures and appliances under normal conditions

To establish the methodology for the new verification method, MBIE initiated a review of international methods used to determine design flow rates for the sizing of water services piping. The review included:

- Identifying other international water supply pipe sizing standards; and
- Conducting a comparison of the water supply size methodologies to the existing requirements in G12/VM1 (AS/NZS 3500.1 and AS/NZS 3500.4) for different building types.

The outcome of this review identified the Plumbing Engineering Services Design Guide 2002 loading unit method as suitable for determining maximum simultaneous flow rates for use in sizing hot and cold-water services for adoption in New Zealand as a verification method. This loading unit method utilises a weighted factor applied to a fixture or appliance and is used for the estimation of simultaneous water flow rates. This estimation method takes account of the flow rate, length of time in use and frequency of use characteristics for each fixture or appliance.

This document is proposed to be cited within Verification Method G12/VM1. As discussed for Proposal 4, the existing compliance pathway is proposed to be moved from G12/VM1 to G12/AS3 to maintain the AS/NZS 3500.1 and AS/NZS 3500.4 standards as a means of compliance with Building Code clause G12.

The new verification method will be suitable for multiple building typologies and is built upon established hydraulic design theory. The costs and benefits of this change were assessed qualitatively. MBIE expects the following from this change:

- The proposed G12/VM1 will provide plumbing systems designers with a deemed to comply method for calculating design flow rates for multiple types of buildings.
- The loading unit method of the Plumbing Engineering Services Design Guide is already widely used by designers in New Zealand to size building water supply pipework systems as an alternative solution. Thus, a considerable portion the industry will already be familiar with its use.

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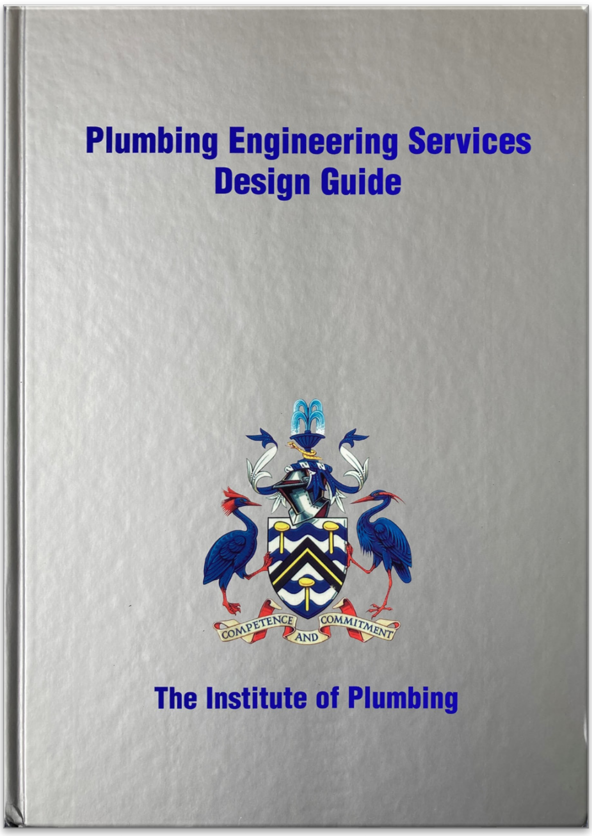
[14] HCAA Water Demand Investigation Results

FIGURE 5.2: Plumbing engineering services design guide



5.3. Transitions

Effective date: 4 November 2022

Transitional arrangements: 12 months

It is proposed that the existing Acceptable Solution G12/AS1 and Verification Method G12/VM1 will remain in force, as if not amended, for a period of 12 months until 2 November 2023 (the proposed cessation date) as described in TABLE 5.1.

TABLE 5.1: Proposed transitional arrangements for the new Acceptable Solution G12/AS1 and Verification Method G12/VM1

Document	Before 3 November 2022	From 3 November 2022 (effective date) To 2 November 2023 (cessation date)
Existing Acceptable Solutions	If used, will be treated as complying with the Building Code	If used, will be treated as complying with the Building Code
Amended Acceptable Solutions	Does not apply to Building Consents issued before this date	If used, will be treated as complying with the Building Code

5.4. Questions for the consultation

5-1. Do you support the amendments to Acceptable Solution G12/AS1 for the following topics?

- Expansion vessels
- Seismic restraint of water heaters
- Accessible taps
- Wet-back water heaters
- UV resistant pipework insulation material
- Cleaning and disinfection of water storage tanks
- Water supply pipework installation standards
- Minimum and maximum water pressures
- Relief valve drain discharge locations and tundish drain sizing
- Minimum pipework cover below ground
- Flushing of water supply systems
- Unintentional heating of cold water.

5-2. Do you support the proposed amendment to Verification Method G12/VM1 to cite the Plumbing engineering services design guides loading unit method for determining maximum simultaneous flow rates for sizing water supply pipework?

5-3. What impacts would you expect on you or your business from the proposed options? These impacts may be economic/financial, environmental, health and wellbeing, or other areas.

5-4. Do you agree with the proposed transition time of 12 months for the proposed changes to take effect?

☐ Yes, it is about right
☐ No, it should be longer (24 months or more)
☐ No, it should be shorter (less than 12 months)
☐ Not sure/no preference.

6. Plumbing and drainage system material standards

We are proposing to cite the latest manufacturing standards for plumbing and drainage system components. These proposed changes form part of regular maintenance updates to address outdated product manufacturing standard citations. In total, there are 12 new or amended standards proposed for citation in Acceptable Solution E1/AS1, 22 for G12/AS1 and G12/AS2, and 12 for G13/AS1 and G13/AS2.

6.1. Reasons for the change

Referenced standards form an important part of the building regulatory system. Standards are consensus-based technical documents that set a benchmark for how to do something. Standards are developed by technical committees and have been used in New Zealand and internationally for decades to inform a number of aspects of building design. They contain necessary details on a repeatable way of doing something which can be used to demonstrate full or partial compliance with the performance requirements of the Building Code.

As building technologies and methods of construction continue to evolve over time, revising the references and citations to technical standards is part of routine maintenance of the acceptable solutions and verification methods. This maintenance ensures that users are provided with the most up-to-date information and removes uncertainty in the consent process as new information becomes available for use.

6.2. Proposed changes

The proposed changes for this proposal are to cite new, or amended versions of product manufacturing standards covering:

- Cross-linked polyethylene (PE-X) pipe and fittings
- Stainless steel pipe and fittings
- Copper pipe and fittings
- Polybutylene pipe and fittings
- Polypropylene pipe and fittings
- Buried flexible pipes
- Polyethylene pipe and fittings
- PVC pipes and fittings
- Stainless steel pipe and fittings
- Vitrified clay pipes
- Ductile iron pipe and fittings
- Copper sheet
- Aluminium pipes
- Stainless steel sheet
- Zinc aluminium sheet.

We are also proposing to:

- Remove galvanised steel as an acceptable material for hot and cold water pipework systems from G12/AS1 Table 1 as it is no longer considered fit for purpose.
- Cite the latest 2018 version of the plumbing product testing standard AS/NZS 4020 in G12/AS1 Paragraph 2.1.2 to make it easier for accredited test laboratories to verify that plumbing products in contact with drinking water are safe to use.

- Include an informative comment indicating that WaterMarked[15] products may be verified as satisfying the relevant performance requirements of Building Code Clause G12 Water supplies and G13 Foul water within G12/AS1, G13/AS1 and G13/AS2.
- Amend G13/AS1 Table 1 and G13/AS2 Table 1 to include additional acceptable materials for sanitary plumbing and drainage systems and cite the relevant standards for their manufacturing and installation.

There are 12 new or amended standards proposed for Acceptable Solution E1/AS1, 22 for G12/AS1 and G12/AS2, and 12 for G13/AS1 and G13/AS2. The proposed standards to be cited are listed in the appendices along with draft text for their citation in the documents. This also includes minor revisions to tables and text within the documents to cite the new standards. For more details, please refer to:

- Appendix A for proposed changes to Acceptable Solution E1/AS1 for surface water drainage system materials.
- Appendix B for proposed changes to Acceptable Solutions G12/AS1 and G12/AS2 for water supply system materials.
- Appendix C for proposed changes to Acceptable Solutions G13/AS1 and G13/AS2 for foul water system materials.

6.3. Options considered

For this proposal, MBIE considered the following three options against the status quo:

Option 1: Insert the applicable requirements directly into the acceptable solutions and verification methods
This option was not considered to be reasonable as the material is too large and impractical for direct publication in the acceptable solutions and verification methods.

Option 2: Identify alternative standards and reference those documents instead
This option is recommended where the current standards have been revoked and no other suitable standards specific to the context in New Zealand were identified. Where a new version of a standard exists, it was not considered to be reasonable to seek alternatives to those that are currently cited in the acceptable solutions and verification methods.

Option 3: Revise the references and citations to reflect the newest versions of the published version
Option 3 is recommended where a new version of the standard exists. This option allows the standard to maintain up-to-date information for the requirements and to reduce confusion and disconnect between industry practice and compliance with the Building Code.

The recommended options (either Option 2 or 3) are detailed in the proposed changes. A majority of the standards proposed to be cited in this proposal fall within Option 3 and have been published as New Zealand, Australian, or joint New Zealand-Australian standards.

6.4. Analysis

The citation of these standards contributes to achieving the Building Code objectives for E1 Surface Water, G12 Water Supplies, and G13 Foul Water and their associated function requirements and performance criteria. The objectives of these clauses state:

Objective

E1.1 The objective of this provision is to–
  (a) safeguard people from injury or illness, and other property from damage, caused by surface water, and
  (b) Protect the outfalls of drainage systems.

G12.1 The objective of this provision is to–
  (a) safeguard people from illness caused by contaminated water

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[15] ABCB What is WaterMark?

(b) safeguard people from injury caused by hot water system explosion, or from contact with excessively hot water:

(c) safeguard people from loss of amenity arising from–

(i) a lack of hot water for personal hygiene; or

(ii) water for human consumption, which is offensive in appearance, odour or taste

(d) ensure that people with disabilities are able to carry out normal activities and functions within buildings.

G13.1 The objective of this provision is to:

(a) Safeguard people from illness due to infection or contamination resulting from personal hygiene activities; and

(b) Safeguard people from loss of amenity due to the presence of unpleasant odours or the accumulation of offensive matter resulting from foul water disposal.

The proposed standards to be cited have been reviewed against the criteria outlined in the MBIE Operating Protocol - Referencing standards in the Building Code system[16].

No significant issues were identified that would prohibit them from being cited in the acceptable solutions and verification methods. Additionally, no modifications to the standards are proposed for their citation.

No significant impact or costs have been identified for amending these standards. MBIE understands that most manufacturers already complying with the newer versions of the standards. Thus, the primary benefit of this proposal are:

- More efficient consenting as Building Consent Authorities would be able to accept products manufactured in accordance with the proposed standards as ‘deemed to comply’ with the Building Code, and
- Increased confidence in building products used to achieve the objectives for E1, G12, and G13 by using the latest version of the standards.

Additionally, citing the newest versions of these standards may support manufacturers to comply with new building product information laws[17] in the future. These new laws were consulted on in 2021 and the final regulations are currently being developed.

For more information on the requirements in the standards, please review the standards and document in full.

6.5. Transitions

Effective date: 3 November 2022

Transitional arrangements: 12 months

It is proposed that the existing Acceptable Solutions E1/AS1, E1/AS2, G12/AS1, G12/AS2, G13/AS1, and G13/AS2 will remain in force, as if not amended, for a period of 12 months until 2 November 2023 (the proposed cessation date) as described in TABLE 6.1.

TABLE 6.1: Proposed transitional arrangements for the new Acceptable Solutions E1/AS1, E1/AS2, G12/AS1, G12/AS2, G13/AS1, and G13/AS2

Document	Before 3 November 2022	From 3 November 2022 (effective date) To 2 November 2023 (cessation date)
Existing Acceptable Solutions	If used, will be treated as complying with the Building Code	If used, will be treated as complying with the Building Code
Amended Acceptable Solutions	Does not apply to Building Consents issued before this date	If used, will be treated as complying with the Building Code

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[16] Referencing standards in the Building Code system

[17] Building Law Reforms - Building product information requirements

6.6. Questions for the consultation

6-1 Do you support the amendments to the following to include the proposed referenced standards and documents for manufacturing plumbing and drainage system components?

- Acceptable Solution E1/AS1 for surface water drainage system materials
- Acceptable Solutions G12/AS1 and G12/AS2 for water supply system materials
- Acceptable Solutions G13/AS1 and G13/AS2 for sanitary plumbing and foul water drainage system materials.

The list of standards is provided in the appendices to the consultation document. If there are standards you don't support, please tell us which standards those are and any reason(s) for your choice.

6-2 What impacts would you expect on you or your business from the referencing of these standards? These impacts may be economic/financial, environmental, health and wellbeing, or other areas.

6-3 Do you agree with the proposed transition time of 12 months for the proposed changes to take effect?

☐ Yes, it is about right

☐ No, it should be longer (24 months or more)

☐ No, it should be shorter (less than 12 months)

☐ Not sure/no preference.

7. Resolving conflicts and editorial changes

We are proposing to amend Acceptable Solutions E1/AS1, G12/AS1, G12/AS2, G13/AS1 and G13/AS2 to make editorial changes and align requirements between compliance pathways for plumbing and drainage systems. Editorial changes may include obvious errors in the text, typos, spelling mistakes, incorrect cross-references, changes in the formatting, minor clarifications of text with minor to no impact, or other items related to current document drafting practices.

7.1. Proposed changes

This proposal contains editorial items and amendments to clarify the existing requirements and resolve existing conflicts in the acceptable solutions used to comply with the Building Code. For these items, the only practicable option identified is to amend the text as this will provide consistency and clarity in the understanding and interpretation of the acceptable solutions. No substantial costs or impacts were identified for these proposed changes.

The proposed changes are described below.

- E1/AS1 Providing example surface water sump catchment area calculations – This proposed change involves the addition of a sample calculation example in a comment to Acceptable Solution E1/AS1 Paragraph 3.6.2. This is intended to aid in the interpretation of the calculations for determining the maximum catchment area for type 1 and 2 surface water sumps. This comment box is provided for information only and not intended to affect the level of performance expected in design.
- G12/AS1 Storage water heater vent pipe standing water level – This proposed change involves updating a dimension in G12/AS1 Figure 7 to align the standing water level dimension with the requirements of G12/AS1 Paragraph 6.8.2 e). The water level in the vent pipe in the figure is proposed to be shown with a minimum height of 3.0 metres above the highest outlet.
- G12/AS1 Free outlet (push through) storage water heating system relief valve – This proposed change involves the inclusion of a relief valve on the free outlet (push through) water heater shown in G12/AS1 Figure 11 to align with the requirement for this valve in G12/AS1 Paragraph 6.4.2.
- G12/AS1 Legionella control within circulatory heated water systems – This proposed change involves shifting G12/AS1 Paragraph 6.14.4 to an informative comment and providing clarification that the design and installation of hot or warm water circulating systems and alternative methods of controlling Legionella within these systems is outside the scope of this Acceptable Solution.
- G12/AS1 Water pipe size table references – This proposed change involves amending the water pipe size table references in G12/AS1 Paragraph 5.3.1 comment, Table 3 and Table 4.
- G12/AS1 PVC-U pipework testing method paragraph structure – This proposed change involves amending the structure of G12/AS1 Paragraph 7.5.2 PVC-U for consistency.
- G12/AS2 Flashing of pipe penetrations through profiled metal roofs – This proposed change includes updating the flashing requirements for pipework penetrations through profiled metal roofs within Acceptable Solution G12/AS2 Paragraph 5.2.5 a). This amendment is required for consistency with equivalent requirements found in Acceptable Solution E2/AS1 Paragraph 8.4.17 a).
- G13/AS1 and G13/AS2 Installation provisions for junctions in graded pipes and drains – The proposed change includes updating the installation requirements for junctions in graded pipes and drains within Acceptable Solutions G13/AS1 Sanitary plumbing and G13/AS2 Foul water drainage. These are required in order to be consistent with equivalent requirements under G13/AS3 Sanitary plumbing and drainage (AS/NZS 3500.2: 2021). Junctions in graded discharge pipes and drains are proposed to have an upstream angle of no greater than 45° and be positioned at an incline of not less than 15° above the horizontal to reduce the risk of blockage.

- G13/AS2 Gully trap height above unpaved ground level – The proposed change includes reducing the minimum overflow level for a gully dish above unpaved surfaces within G13/AS2 Paragraph 3.3.1 a) ii) from 100 mm to 75 mm. This is to be made consistent with equivalent requirements under G13/AS3 Sanitary plumbing and drainage (AS/NZS 3500.2: 2021).

For more details on the proposed changes, please refer to:

- Appendix A for proposed editorial changes to Acceptable Solutions E1/AS1
- Appendix B for proposed editorial changes to Acceptable Solutions G12/AS1 and G12/AS2
- Appendix C for proposed editorial changes to Acceptable Solutions G13/AS1 and G13/AS2.

7.2. Transitions

Effective date: 3 November 2022

Transitional arrangements: 12 months

It is proposed that the existing Acceptable Solutions E1/AS1, G12/AS1, G12/AS2, G13/AS1 and G13/AS2 will remain in force, as if not amended, for a period of 12 months until 2 November 2023 (the proposed cessation date) as described in TABLE 7.1. The proposed transition period of 12 months is intended to align with those for other proposals. This is intended to minimise confusion on which documents and what requirements are in effect on what date.

TABLE 7.1: Proposed transitional arrangements for the new Acceptable Solutions E1/AS1, G12/AS1, G12/AS2, G13/AS1, and G13/AS2

Document	Before 3 November 2022	From 3 November 2022 (effective date) To 2 November 2023 (cessation date)
Existing Acceptable Solutions	If used, will be treated as complying with the Building Code	If used, will be treated as complying with the Building Code
Amended Acceptable Solutions	Does not apply to Building Consents issued before this date	If used, will be treated as complying with the Building Code

7.3. Questions for the consultation

7-1 Do you support the following amendments to the acceptable solutions to address the editorial changes and align plumbing and drainage requirements as proposed?

E1/AS1:	☐ Yes, I support it	☐ No, I don’t support it	☐ Not sure/no preference
G12/AS1:	☐ Yes, I support it	☐ No, I don’t support it	☐ Not sure/no preference
G12/AS2:	☐ Yes, I support it	☐ No, I don’t support it	☐ Not sure/no preference
G13/AS1:	☐ Yes, I support it	☐ No, I don’t support it	☐ Not sure/no preference
G13/AS2:	☐ Yes, I support it	☐ No, I don’t support it	☐ Not sure/no preference

Appendix A. Proposed changes to the acceptable solutions and verification methods for clause E1 Surface Water

As part of Proposals 4, 6 and 7, here are proposed changes to the acceptable solutions and verification methods for clause E1 Surface Water. The list below identifies the portions of the documents that are proposed to be amended as part of each proposal. The proposed changes are also presented as part of the full document with the new or amended text shown in blue.

Proposal 4. AS/NZS 3500 Plumbing and drainage standards

- Acceptable Solution E1/AS3
  - Cite the new AS/NZS 3500.3: 2021 Plumbing and drainage – Stormwater drainage
  - Remove the modifications to AS/NZS 3500.3 previously found in E1/AS2 for Clauses 1.2.2, 3.3.5.2, 3.4.5, 3.7.3, 3.7.7.1, 3.8, 5.2.3, 5.3.1.1, 5.4.8 (b) (ii), 5.4.11.1 (b), 5.4.12, 5.5, 6.2.8 (d) (ii), 6.3.3 (b); and Table 6.2.5.1; and Appendices F, I, and K. These modifications are no longer necessary for the proposed citation of AS/NZS 3500.3: 2021
  - Update the modification to AS/NZS 3500.3 for Clause 5.4.5 (b) for rainfall intensity data sources

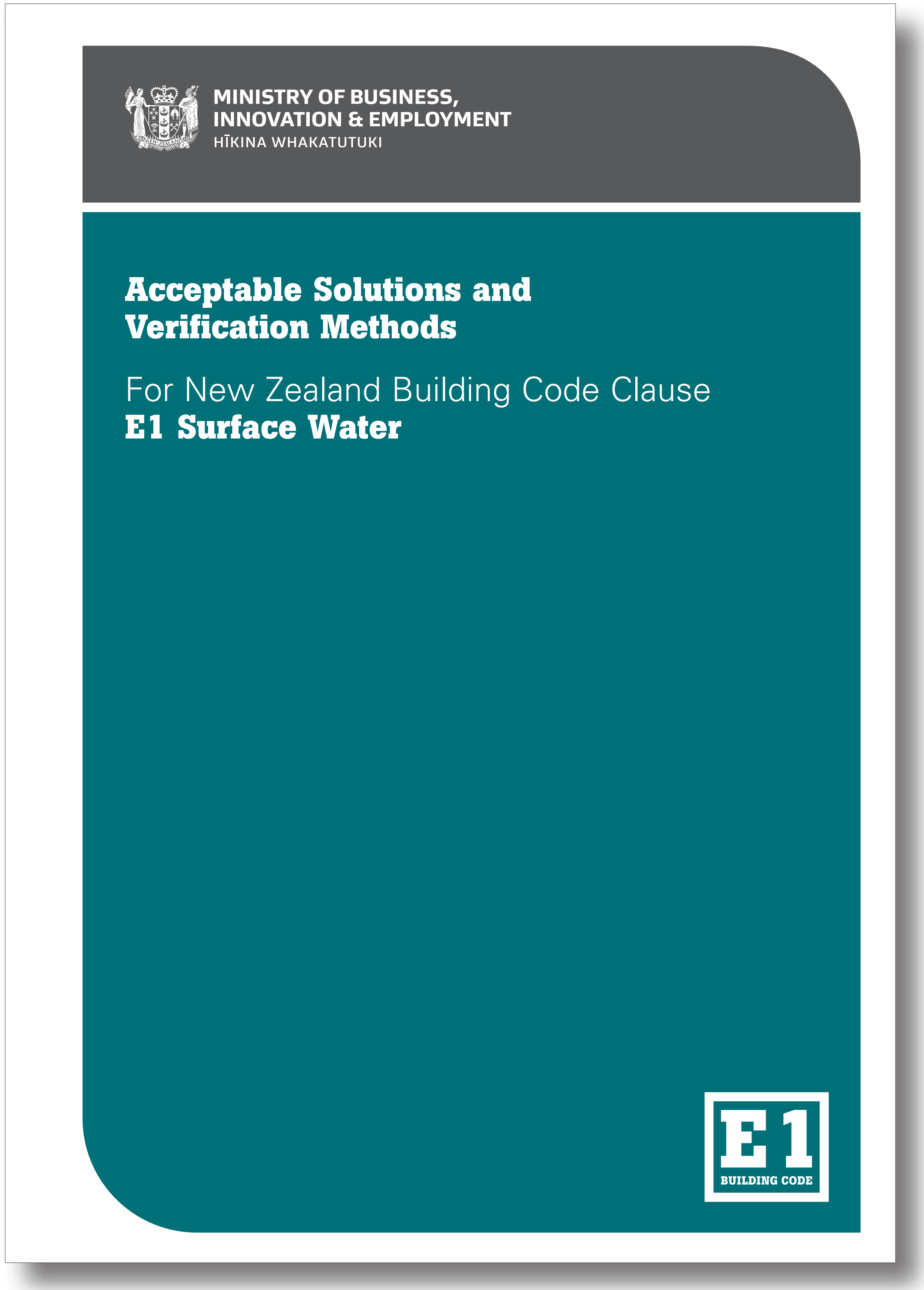
Proposal 6. Plumbing and drainage system material standards

- Cite the following surface water drainage material standards in Acceptable Solution E1/AS1
  - AS/NZS 1254: 2010 PVC-U pipes and fittings for stormwater and surface water applications Amendment 3: 2018
  - AS/NZS 2280: 2020 Ductile iron pipes and fittings Amendment 1
  - AS/NZS 2566.1: 1998 Buried Flexible pipelines – Structural Design Amendment 1: 2017
  - NZS 3501: 1976 Specification for copper tubes for water, gas, and sanitation Amendments: 1, 2, 3
  - AS/NZS 4130: 2018 Polyethylene (PE) pipes for pressure applications Amendment: 1: 2021
  - BS EN 1172: 2011 Copper and copper alloys – sheet and strip for building purposes
  - AS 1397: 2021 Continuous hot-dip metallic coated steel sheet and strip – Coatings of zinc and zinc alloyed with aluminium and magnesium
  - AS 1432: 2004 Copper tubes for plumbing, gasfitting and drainage applications
  - AS 1528.1: 2019 Stainless steel tubes and tube fittings for food processing and hygienic applications – Tubes
  - AS 1566: 1997 Copper and copper alloys – Rolled flat products
  - AS 1866: 1997 Aluminium and aluminium alloys - Extruded rod, bar, solid and hollow shapes
  - ASTM A240/A240M: 2020 Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
- Other changes as part of this proposal in Acceptable Solution E1/AS1
  - Remove the citation for NZS/BS 970.1: 1991 Specification for wrought steels for mechanical and allied engineering purposes – General inspection and testing procedures and specific requirements for carbon, carbon manganese, alloy and stainless steels Amendment 1. This standard has been revoked and the applicable references in the acceptable solution are proposed to cite ASTM A240 instead
  - Revise the acceptable material standards for rainwater downpipes and gutters listed in Tables 4 and 6 to include NZS 3501, AS/NZS 4130, AS 1432, AS 1528, AS 1566, AS 1866, and ASTM A240M

Proposal 7. Resolving conflicts and editorial changes

- Provide a sump calculation example in a comment to E1/AS1 Paragraph 3.6.2

Current E1 Surface Water - No changes proposed to this page



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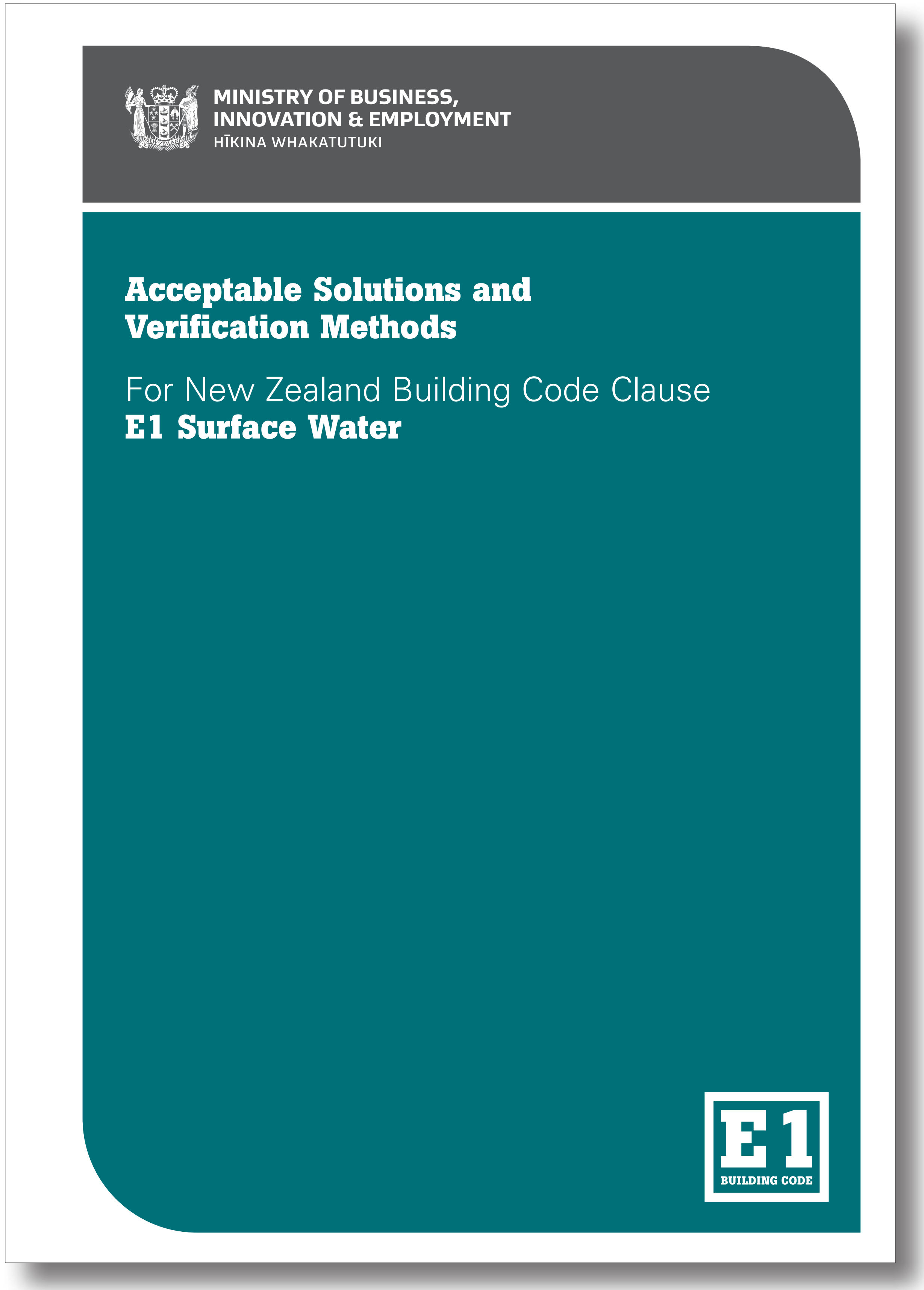
Acceptable Solutions and Verification Methods

For New Zealand Building Code Clause
E1 Surface Water

E1
BUILDING CODE

Proposed E1 Surface Water - No changes proposed to this page



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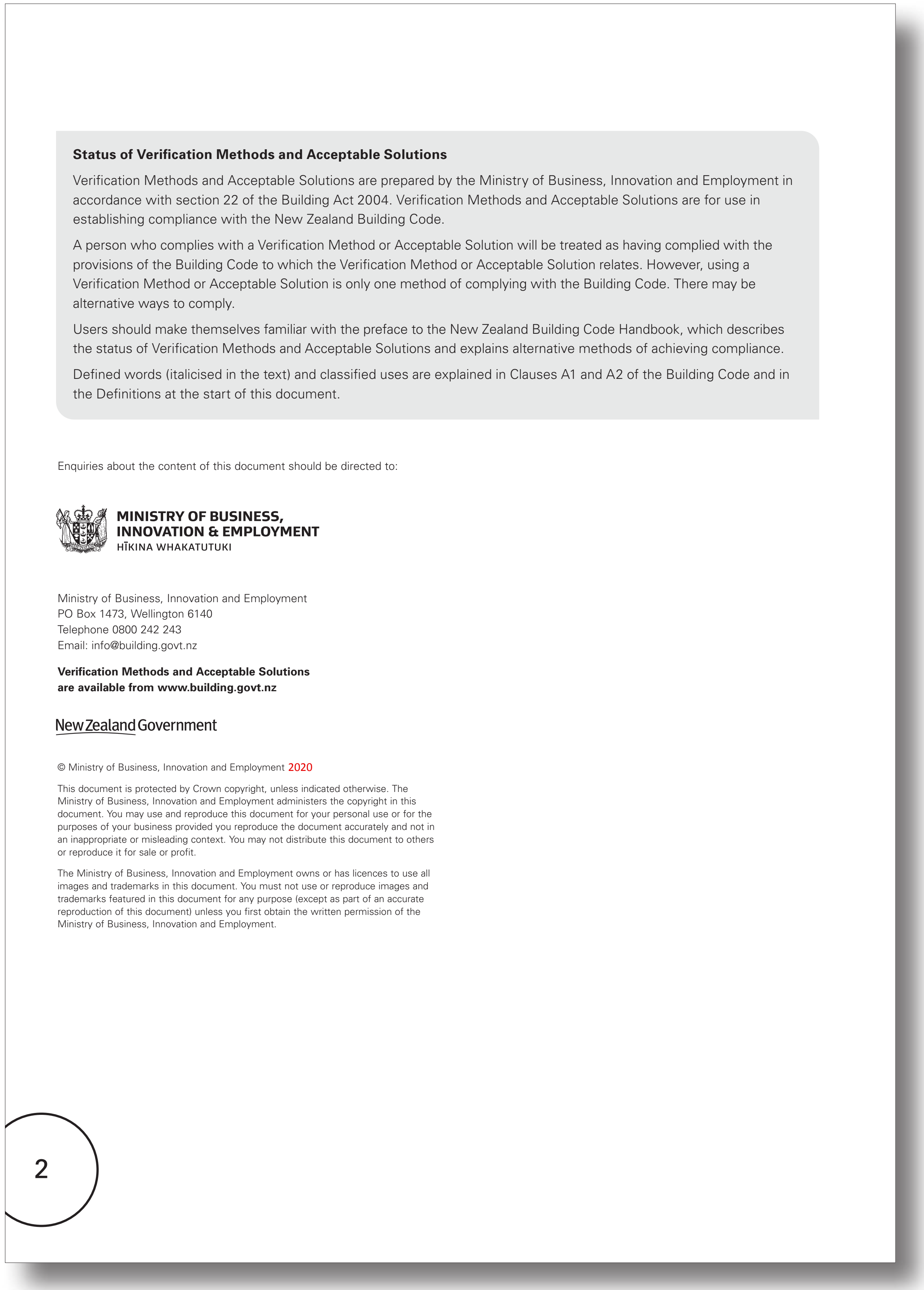
Acceptable Solutions and Verification Methods

For New Zealand Building Code Clause
E1 Surface Water

E1
BUILDING CODE

Current E1 Surface Water acceptable solutions and verification methods (Text to be amended shown in red)



Status of Verification Methods and Acceptable Solutions

Verification Methods and Acceptable Solutions are prepared by the Ministry of Business, Innovation and Employment in accordance with section 22 of the Building Act 2004. Verification Methods and Acceptable Solutions are for use in establishing compliance with the New Zealand Building Code.

A person who complies with a Verification Method or Acceptable Solution will be treated as having complied with the provisions of the Building Code to which the Verification Method or Acceptable Solution relates. However, using a Verification Method or Acceptable Solution is only one method of complying with the Building Code. There may be alternative ways to comply.

Users should make themselves familiar with the preface to the New Zealand Building Code Handbook, which describes the status of Verification Methods and Acceptable Solutions and explains alternative methods of achieving compliance.

Defined words (italicised in the text) and classified uses are explained in Clauses A1 and A2 of the Building Code and in the Definitions at the start of this document.

Enquiries about the content of this document should be directed to:

MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

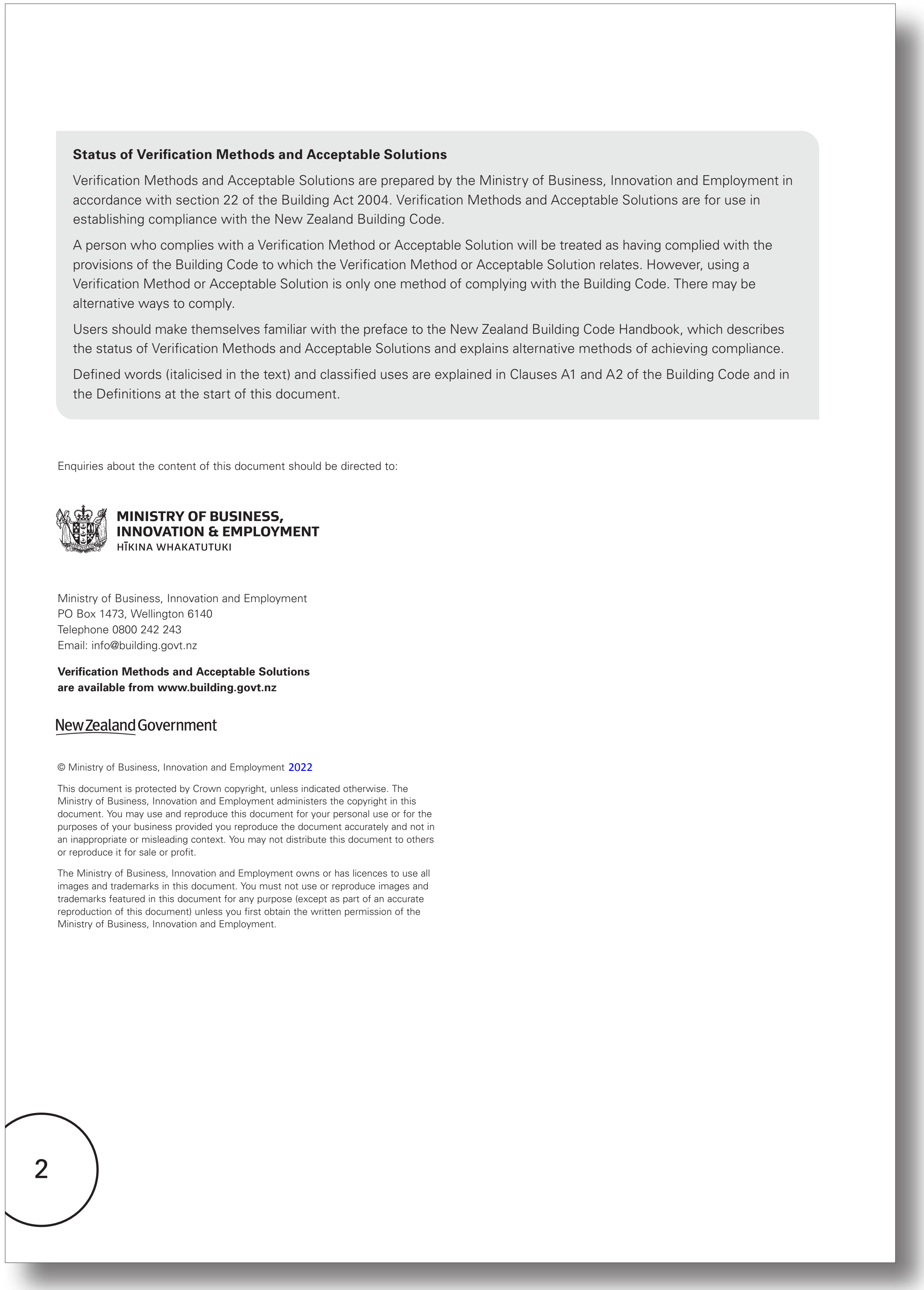
Ministry of Business, Innovation and Employment
PO Box 1473, Wellington 6140
Telephone 0800 242 243
Email: info@building.govt.nz

Verification Methods and Acceptable Solutions
are available from www.building.govt.nz

New Zealand Government

2

Proposed amendments to E1 Surface Water acceptable solutions and verification methods (Proposed text in blue)



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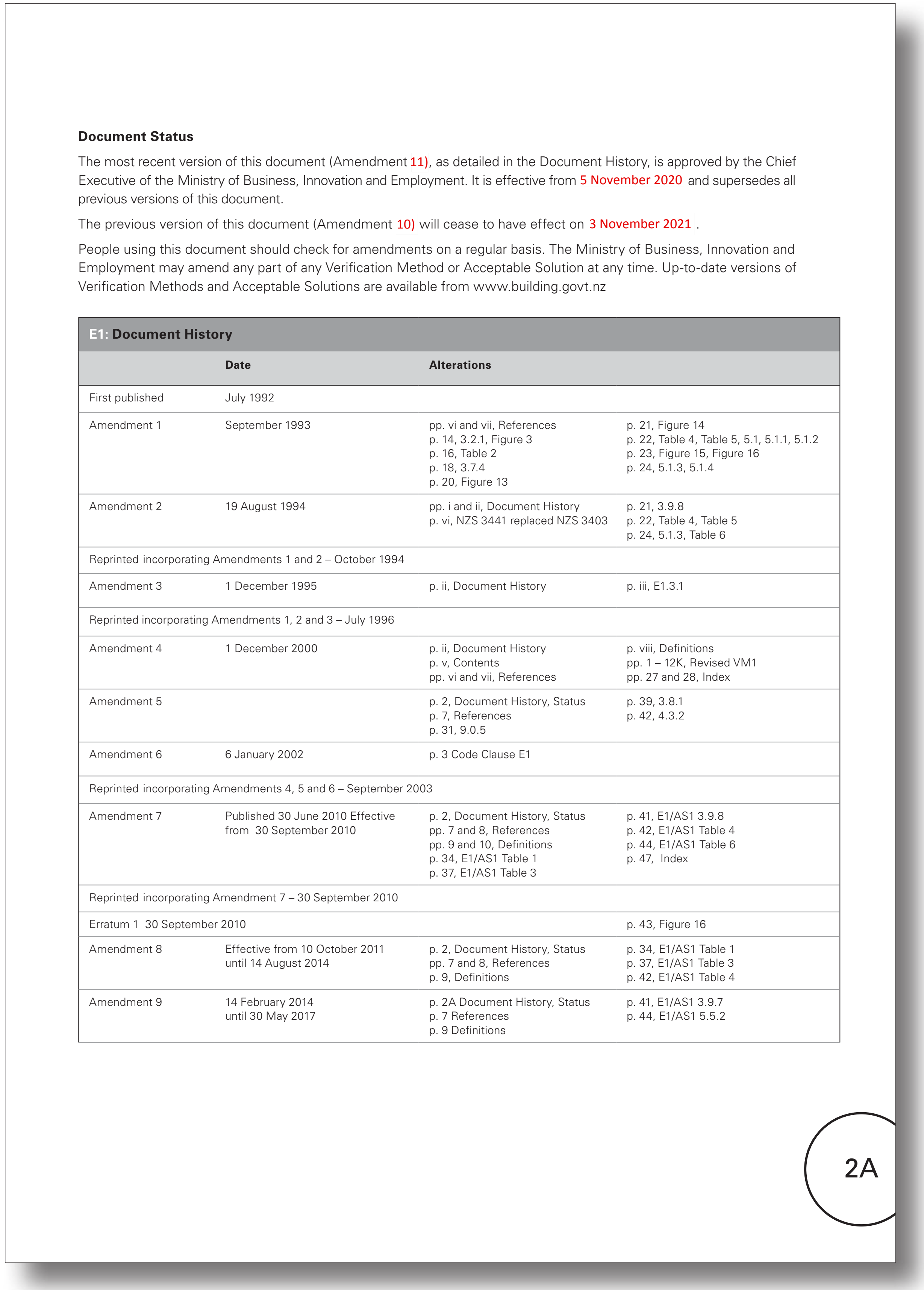
2

Appendix A. Proposed changes to the acceptable solutions and verification methods for clause E1 Surface Water

Current E1 Surface Water acceptable solutions and verification methods (Text to be amended shown in red)



Document Status

The most recent version of this document (Amendment 11), as detailed in the Document History, is approved by the Chief Executive of the Ministry of Business, Innovation and Employment. It is effective from 5 November 2020 and supersedes all previous versions of this document.

The previous version of this document (Amendment 10) will cease to have effect on 3 November 2021 .

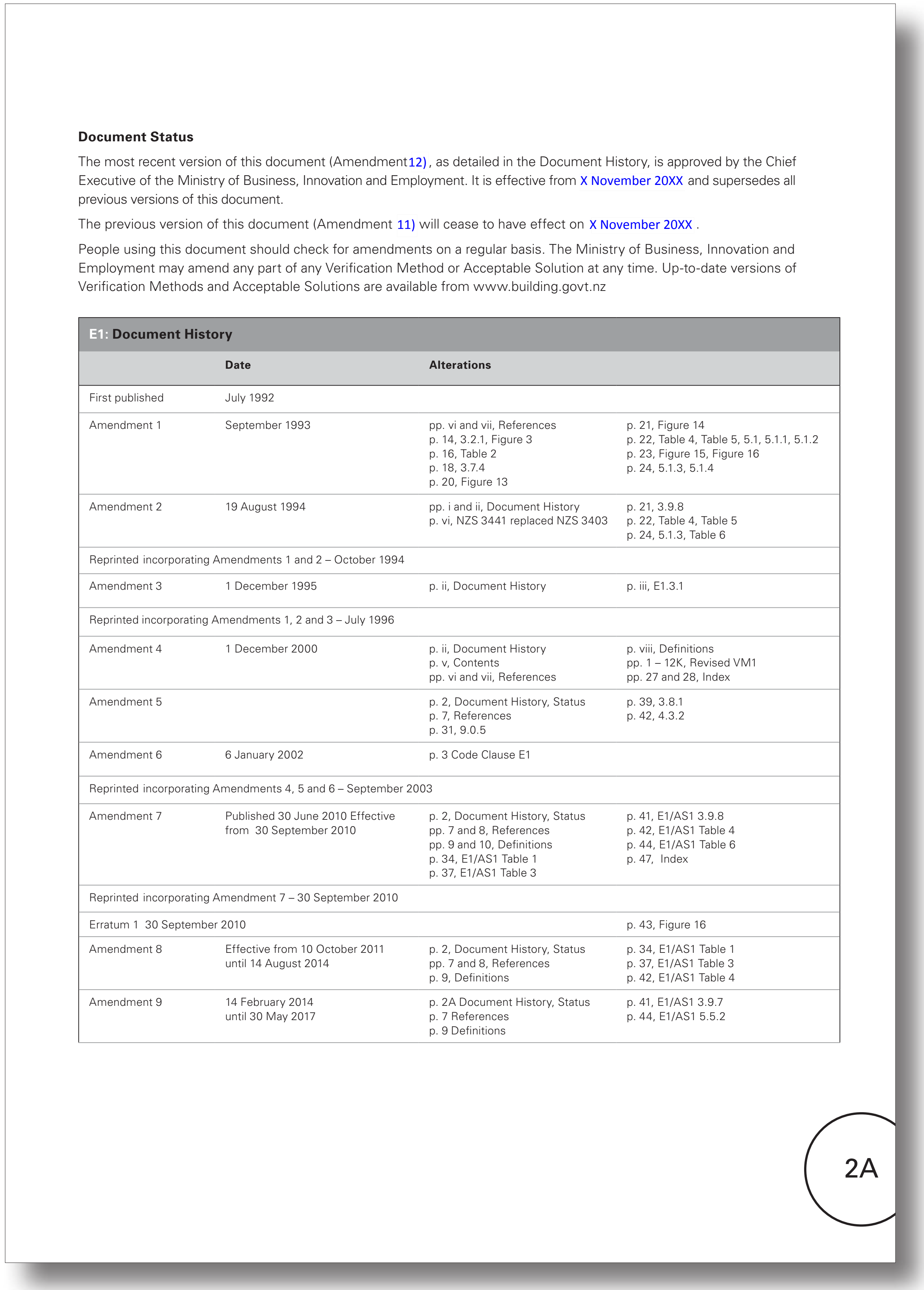
People using this document should check for amendments on a regular basis. The Ministry of Business, Innovation and Employment may amend any part of any Verification Method or Acceptable Solution at any time. Up-to-date versions of Verification Methods and Acceptable Solutions are available from www.building.govt.nz

E1: Document History

	Date	Alterations	
First published	July 1992		
Amendment 1	September 1993	pp. vi and vii, References p. 14, 3.2.1, Figure 3 p. 16, Table 2 p. 18, 3.7.4 p. 20, Figure 13	p. 21, Figure 14 p. 22, Table 4, Table 5, 5.1, 5.1.1, 5.1.2 p. 23, Figure 15, Figure 16 p. 24, 5.1.3, 5.1.4
Amendment 2	19 August 1994	pp. i and ii, Document History p. vi, NZS 3441 replaced NZS 3403	p. 21, 3.9.8 p. 22, Table 4, Table 5 p. 24, 5.1.3, Table 6
Reprinted incorporating Amendments 1 and 2 – October 1994			
Amendment 3	1 December 1995	p. ii, Document History	p. iii, E1.3.1
Reprinted incorporating Amendments 1, 2 and 3 – July 1996			
Amendment 4	1 December 2000	p. ii, Document History p. v, Contents pp. vi and vii, References	p. viii, Definitions pp. 1 – 12K, Revised VM1 pp. 27 and 28, Index
Amendment 5		p. 2, Document History, Status p. 7, References p. 31, 9.0.5	p. 39, 3.8.1 p. 42, 4.3.2
Amendment 6	6 January 2002	p. 3 Code Clause E1	
Reprinted incorporating Amendments 4, 5 and 6 – September 2003			
Amendment 7	Published 30 June 2010 Effective from 30 September 2010	p. 2, Document History, Status pp. 7 and 8, References pp. 9 and 10, Definitions p. 34, E1/AS1 Table 1 p. 37, E1/AS1 Table 3	p. 41, E1/AS1 3.9.8 p. 42, E1/AS1 Table 4 p. 44, E1/AS1 Table 6 p. 47, Index
Reprinted incorporating Amendment 7 – 30 September 2010			
Erratum 1 30 September 2010			p. 43, Figure 16
Amendment 8	Effective from 10 October 2011 until 14 August 2014	p. 2, Document History, Status pp. 7 and 8, References p. 9, Definitions	p. 34, E1/AS1 Table 1 p. 37, E1/AS1 Table 3 p. 42, E1/AS1 Table 4
Amendment 9	14 February 2014 until 30 May 2017	p. 2A Document History, Status p. 7 References p. 9 Definitions	p. 41, E1/AS1 3.9.7 p. 44, E1/AS1 5.5.2

2A

Proposed amendments to E1 Surface Water acceptable solutions and verification methods (Proposed text in blue)



Document Status

The most recent version of this document (Amendment12) , as detailed in the Document History, is approved by the Chief Executive of the Ministry of Business, Innovation and Employment. It is effective from X November 20XX and supersedes all previous versions of this document.

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E1: Document History

	Date	Alterations	
First published	July 1992		
Amendment 1	September 1993	pp. vi and vii, References p. 14, 3.2.1, Figure 3 p. 16, Table 2 p. 18, 3.7.4 p. 20, Figure 13	p. 21, Figure 14 p. 22, Table 4, Table 5, 5.1, 5.1.1, 5.1.2 p. 23, Figure 15, Figure 16 p. 24, 5.1.3, 5.1.4
Amendment 2	19 August 1994	pp. i and ii, Document History p. vi, NZS 3441 replaced NZS 3403	p. 21, 3.9.8 p. 22, Table 4, Table 5 p. 24, 5.1.3, Table 6
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Amendment 3	1 December 1995	p. ii, Document History	p. iii, E1.3.1
Reprinted incorporating Amendments 1, 2 and 3 – July 1996			
Amendment 4	1 December 2000	p. ii, Document History p. v, Contents pp. vi and vii, References	p. viii, Definitions pp. 1 – 12K, Revised VM1 pp. 27 and 28, Index
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Amendment 6	6 January 2002	p. 3 Code Clause E1	
Reprinted incorporating Amendments 4, 5 and 6 – September 2003			
Amendment 7	Published 30 June 2010 Effective from 30 September 2010	p. 2, Document History, Status pp. 7 and 8, References pp. 9 and 10, Definitions p. 34, E1/AS1 Table 1 p. 37, E1/AS1 Table 3	p. 41, E1/AS1 3.9.8 p. 42, E1/AS1 Table 4 p. 44, E1/AS1 Table 6 p. 47, Index
Reprinted incorporating Amendment 7 – 30 September 2010			
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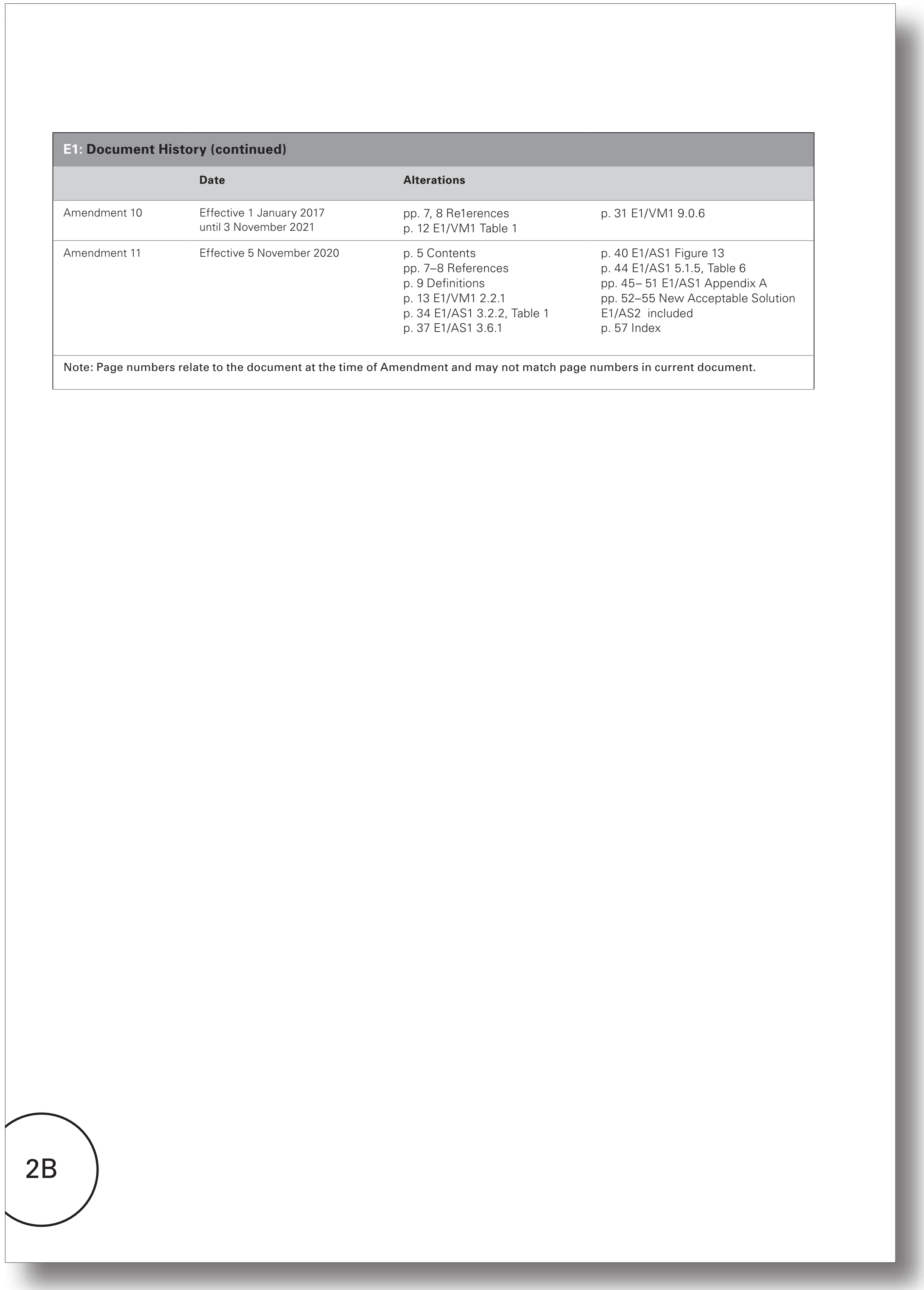
Amendment 9	14 February 2014 until 30 May 2017	p. 2A Document History, Status p. 7 References p. 9 Definitions	p. 41, E1/AS1 3.9.7 p. 44, E1/AS1 5.5.2

2A

Current E1 Surface Water acceptable solutions and verification methods

(Text to be amended shown in red)



E1: Document History (continued)

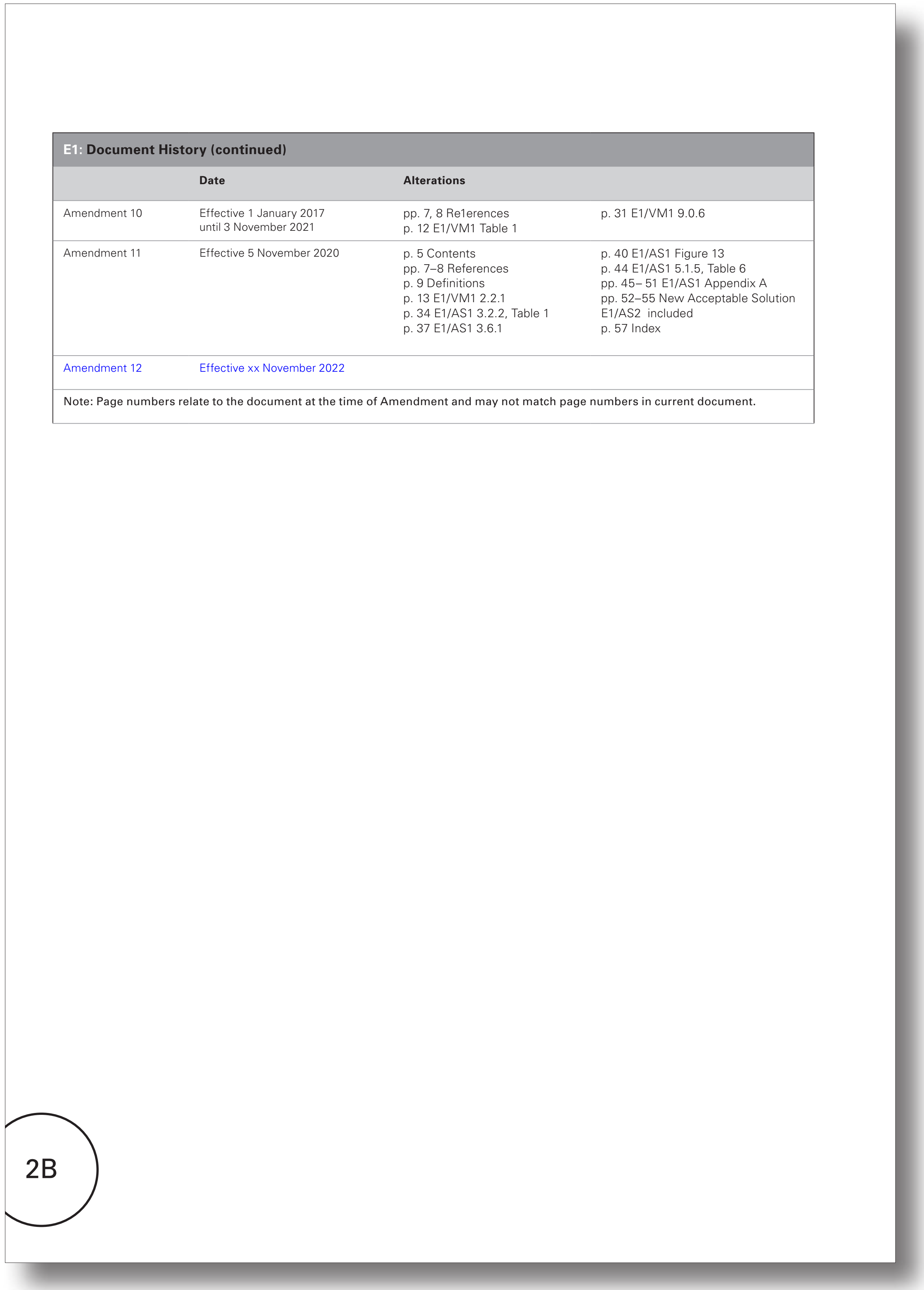
	Date	Alterations	
Amendment 10	Effective 1 January 2017 until 3 November 2021	pp. 7, 8 References p. 12 E1/VM1 Table 1	p. 31 E1/VM1 9.0.6
Amendment 11	Effective 5 November 2020	p. 5 Contents pp. 7–8 References p. 9 Definitions p. 13 E1/VM1 2.2.1 p. 34 E1/AS1 3.2.2, Table 1 p. 37 E1/AS1 3.6.1	p. 40 E1/AS1 Figure 13 p. 44 E1/AS1 5.1.5, Table 6 pp. 45– 51 E1/AS1 Appendix A pp. 52–55 New Acceptable Solution E1/AS2 included p. 57 Index

Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.

2B

Proposed amendments to E1 Surface Water acceptable solutions and verification methods

(Proposed text in blue)



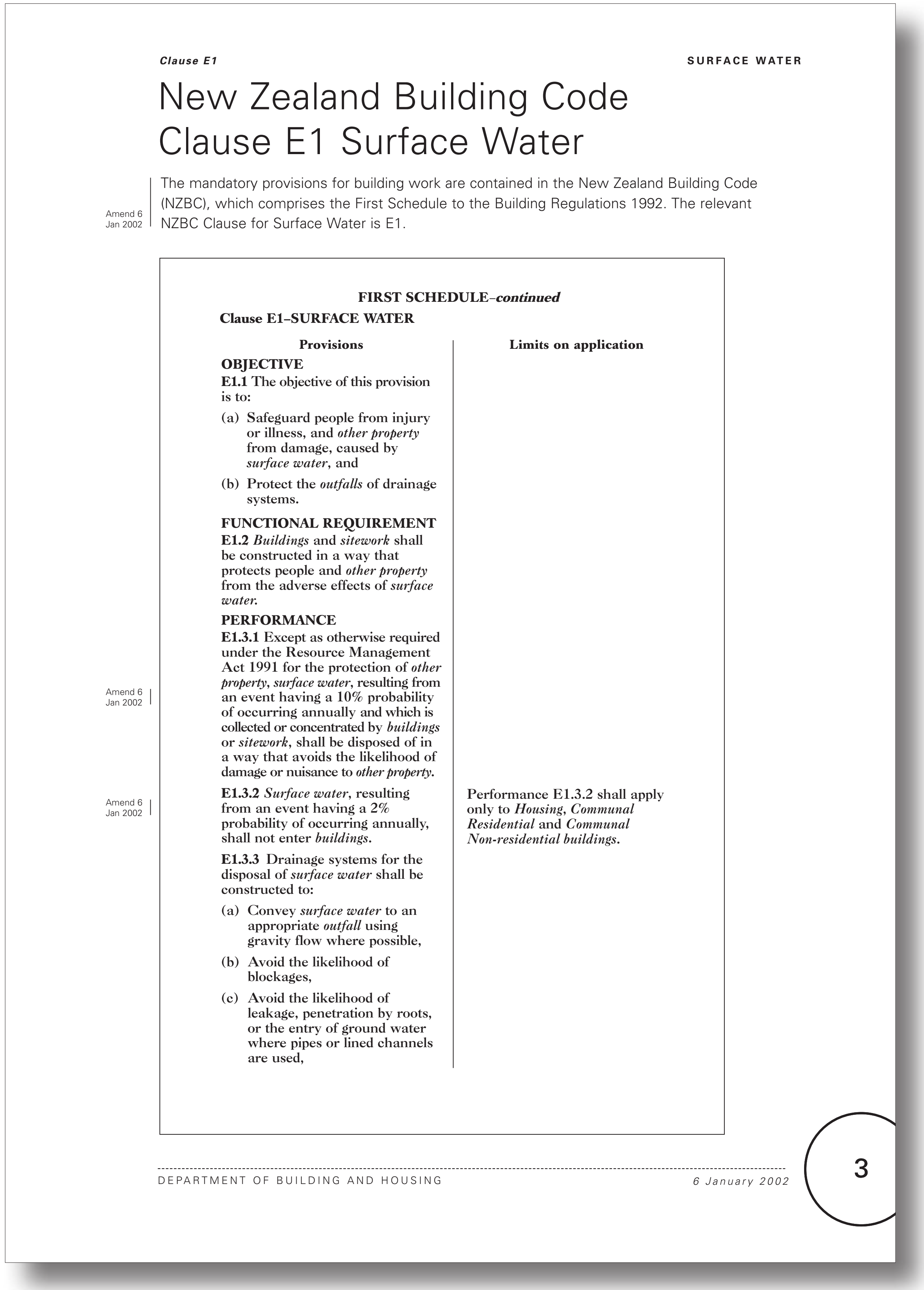
E1: Document History (continued)

	Date	Alterations	
Amendment 10	Effective 1 January 2017 until 3 November 2021	pp. 7, 8 References p. 12 E1/VM1 Table 1	p. 31 E1/VM1 9.0.6
Amendment 11	Effective 5 November 2020	p. 5 Contents pp. 7–8 References p. 9 Definitions p. 13 E1/VM1 2.2.1 p. 34 E1/AS1 3.2.2, Table 1 p. 37 E1/AS1 3.6.1	p. 40 E1/AS1 Figure 13 p. 44 E1/AS1 5.1.5, Table 6 pp. 45– 51 E1/AS1 Appendix A pp. 52–55 New Acceptable Solution E1/AS2 included p. 57 Index
Amendment 12	Effective xx November 2022		

Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.

2B

Current E1 Surface Water - No changes proposed to this page



Clause E1 SURFACE WATER

New Zealand Building Code Clause E1 Surface Water

Amend 6 Jan 2002 The mandatory provisions for building work are contained in the New Zealand Building Code (NZBC), which comprises the First Schedule to the Building Regulations 1992. The relevant NZBC Clause for Surface Water is E1.

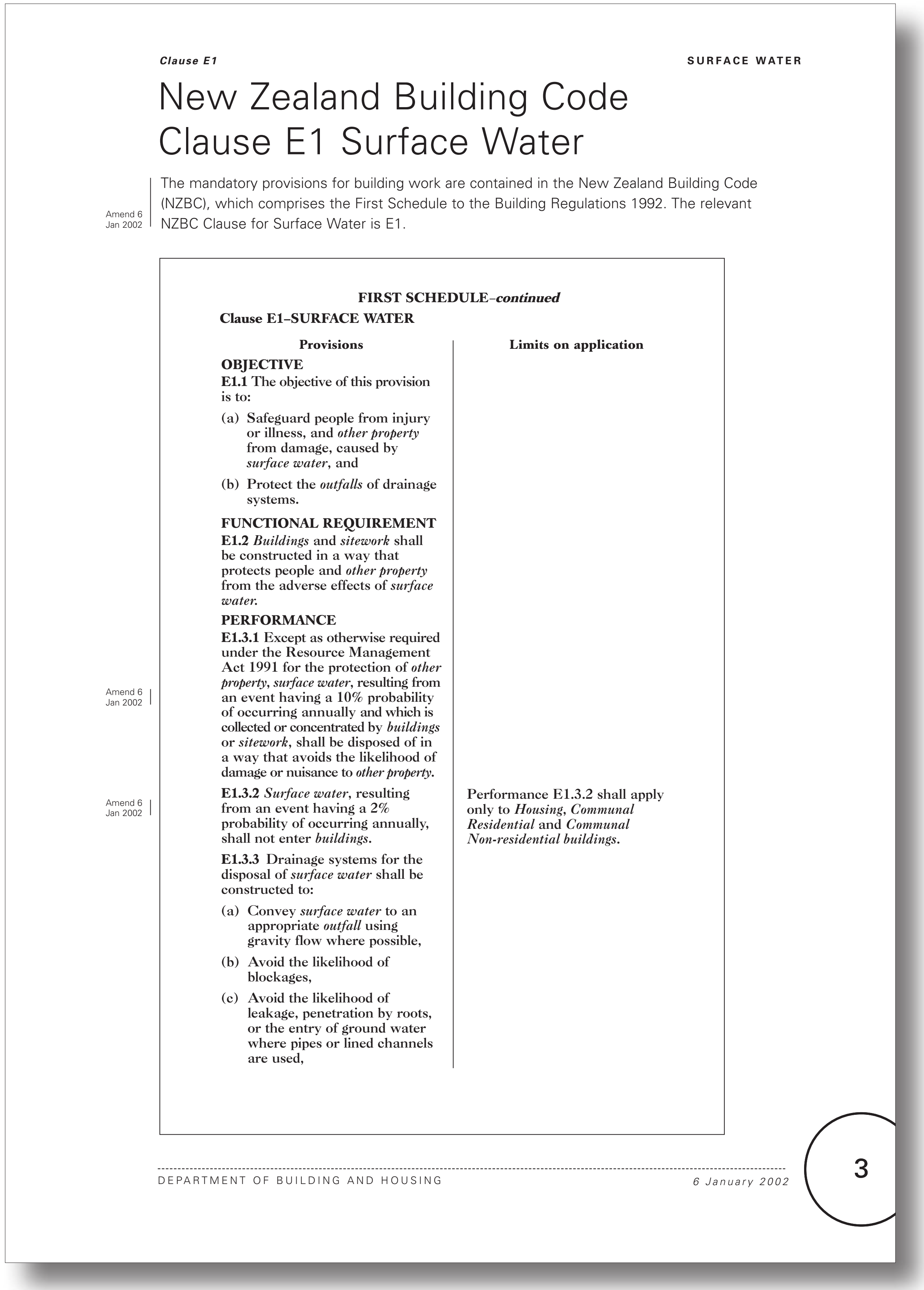
FIRST SCHEDULE–*continued*

Clause E1–SURFACE WATER

Provisions	Limits on application
OBJECTIVE **E1.1** The objective of this provision is to: (a) Safeguard people from injury or illness, and *other property* from damage, caused by *surface water*, and (b) Protect the *outfalls* of drainage systems.	
FUNCTIONAL REQUIREMENT **E1.2** *Buildings* and *sitework* shall be constructed in a way that protects people and *other property* from the adverse effects of *surface water.*	
PERFORMANCE Amend 6 Jan 2002 **E1.3.1** Except as otherwise required under the Resource Management Act 1991 for the protection of *other property, surface water*, resulting from an event having a 10% probability of occurring annually and which is collected or concentrated by *buildings* or *sitework*, shall be disposed of in a way that avoids the likelihood of damage or nuisance to *other property.*	
Amend 6 Jan 2002 **E1.3.2** *Surface water*, resulting from an event having a 2% probability of occurring annually, shall not enter *buildings.*	Performance E1.3.2 shall apply only to *Housing, Communal Residential* and *Communal Non-residential buildings.*
E1.3.3 Drainage systems for the disposal of *surface water* shall be constructed to: (a) Convey *surface water* to an appropriate *outfall* using gravity flow where possible, (b) Avoid the likelihood of blockages, (c) Avoid the likelihood of leakage, penetration by roots, or the entry of ground water where pipes or lined channels are used,	

DEPARTMENT OF BUILDING AND HOUSING *6 January 2002* 3

Proposed E1 Surface Water - No changes proposed to this page



Clause E1 SURFACE WATER

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FIRST SCHEDULE–*continued*

Clause E1–SURFACE WATER

Provisions | Limits on application

OBJECTIVE
E1.1 The objective of this provision is to:
(a) Safeguard people from injury or illness, and *other property* from damage, caused by *surface water*, and
(b) Protect the *outfalls* of drainage systems.

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E1.2 *Buildings* and *sitework* shall be constructed in a way that protects people and *other property* from the adverse effects of *surface water.*

PERFORMANCE
Amend 6 Jan 2002 **E1.3.1** Except as otherwise required under the Resource Management Act 1991 for the protection of *other property, surface water*, resulting from an event having a 10% probability of occurring annually and which is collected or concentrated by *buildings* or *sitework*, shall be disposed of in a way that avoids the likelihood of damage or nuisance to *other property.*

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(a) Convey *surface water* to an appropriate *outfall* using gravity flow where possible,
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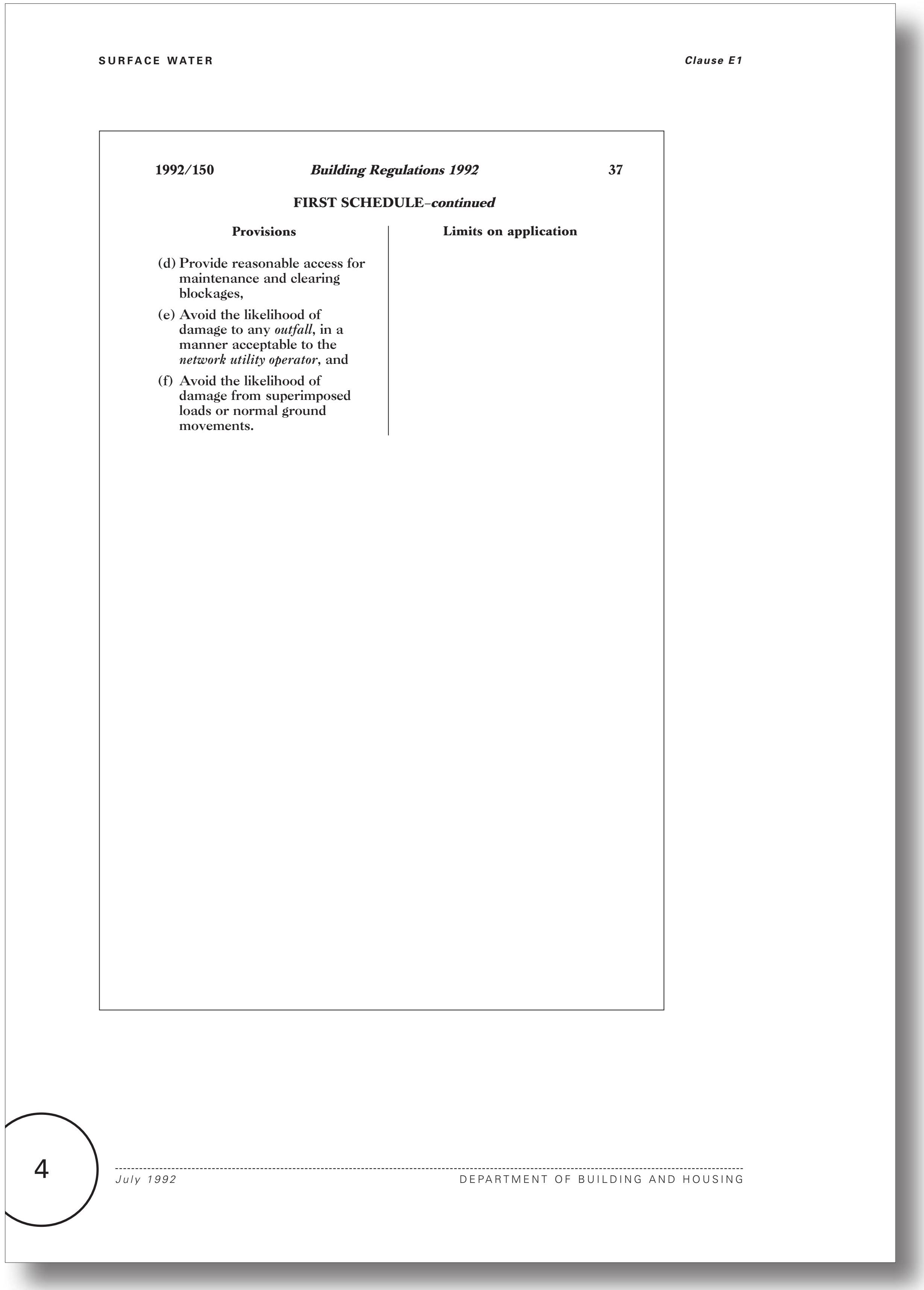
(c) Avoid the likelihood of leakage, penetration by roots, or the entry of ground water where pipes or lined channels are used,

DEPARTMENT OF BUILDING AND HOUSING *6 January 2002* 3

Current E1 Surface Water - No changes proposed to this page



SURFACE WATER Clause E1

1992/150 *Building Regulations 1992* 37

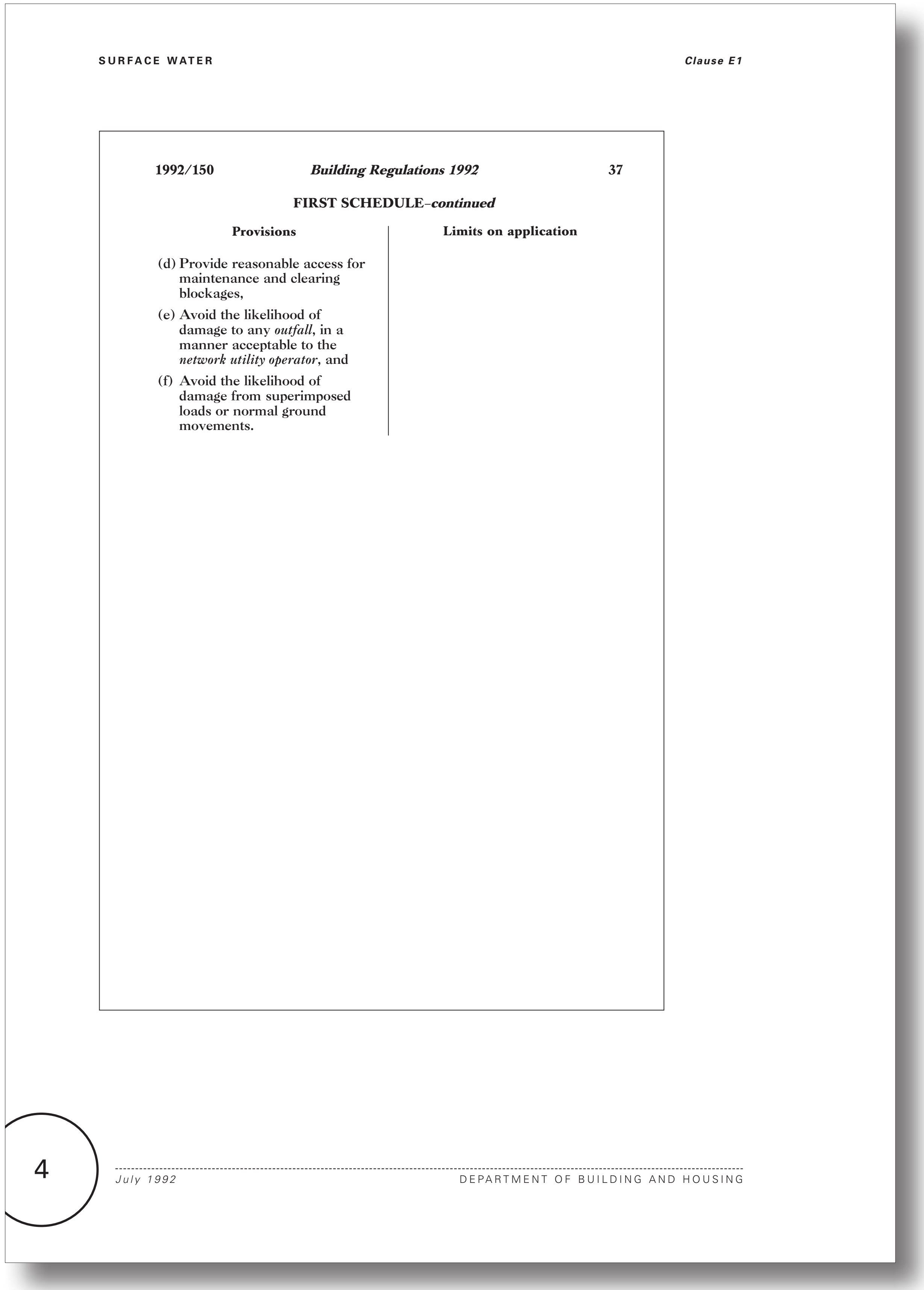
FIRST SCHEDULE–*continued*

Provisions	Limits on application
(d) Provide reasonable access for maintenance and clearing blockages, (e) Avoid the likelihood of damage to any *outfall*, in a manner acceptable to the *network utility operator*, and (f) Avoid the likelihood of damage from superimposed loads or normal ground movements.	

4

July 1992 DEPARTMENT OF BUILDING AND HOUSING

Proposed E1 Surface Water - No changes proposed to this page



SURFACE WATER Clause E1

1992/150 *Building Regulations 1992* 37

FIRST SCHEDULE–*continued*

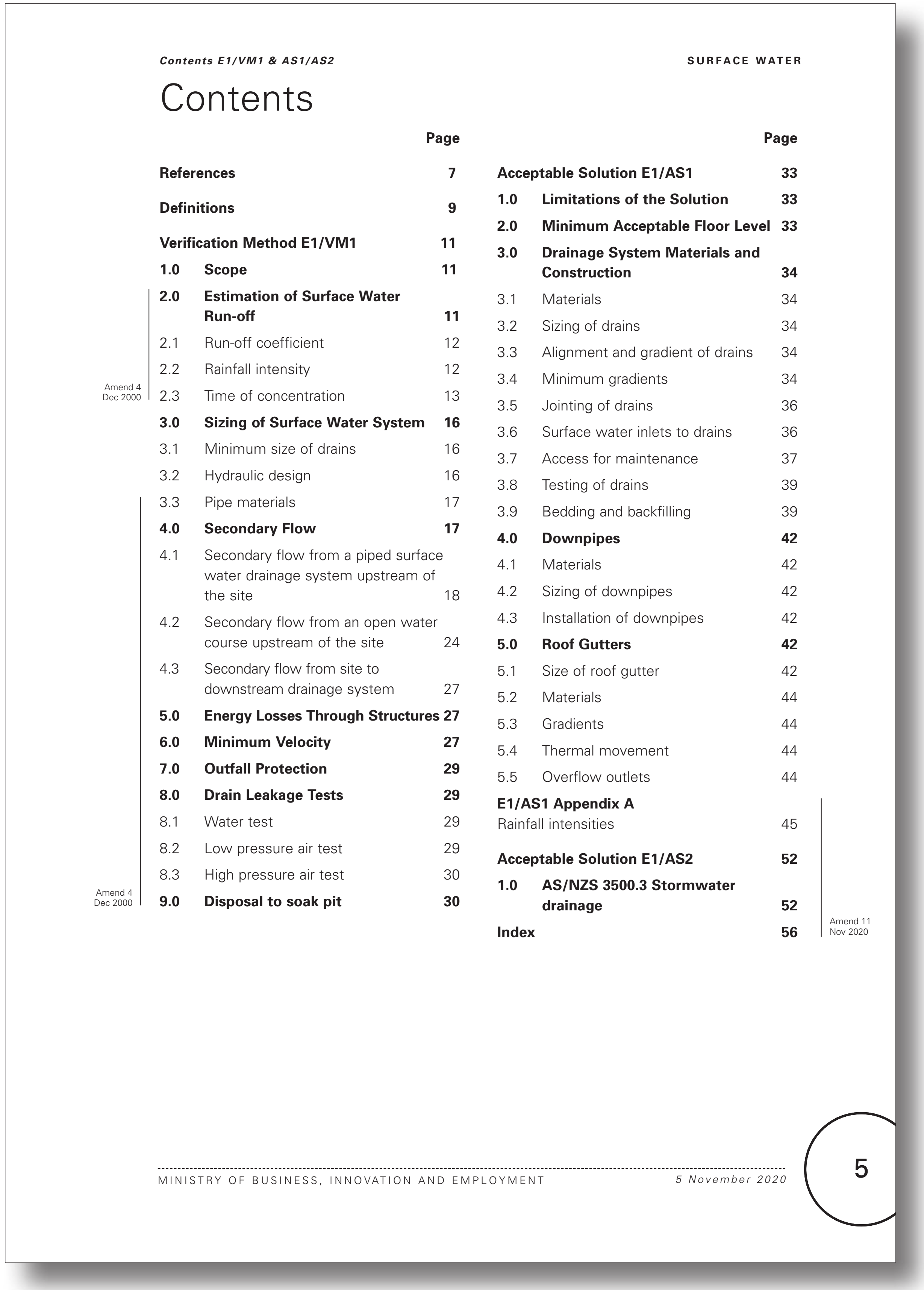
Provisions | Limits on application

(d) Provide reasonable access for maintenance and clearing blockages,
(e) Avoid the likelihood of damage to any *outfall*, in a manner acceptable to the *network utility operator*, and
(f) Avoid the likelihood of damage from superimposed loads or normal ground movements.

4

July 1992 DEPARTMENT OF BUILDING AND HOUSING

Current E1 Surface Water - No changes proposed to this page



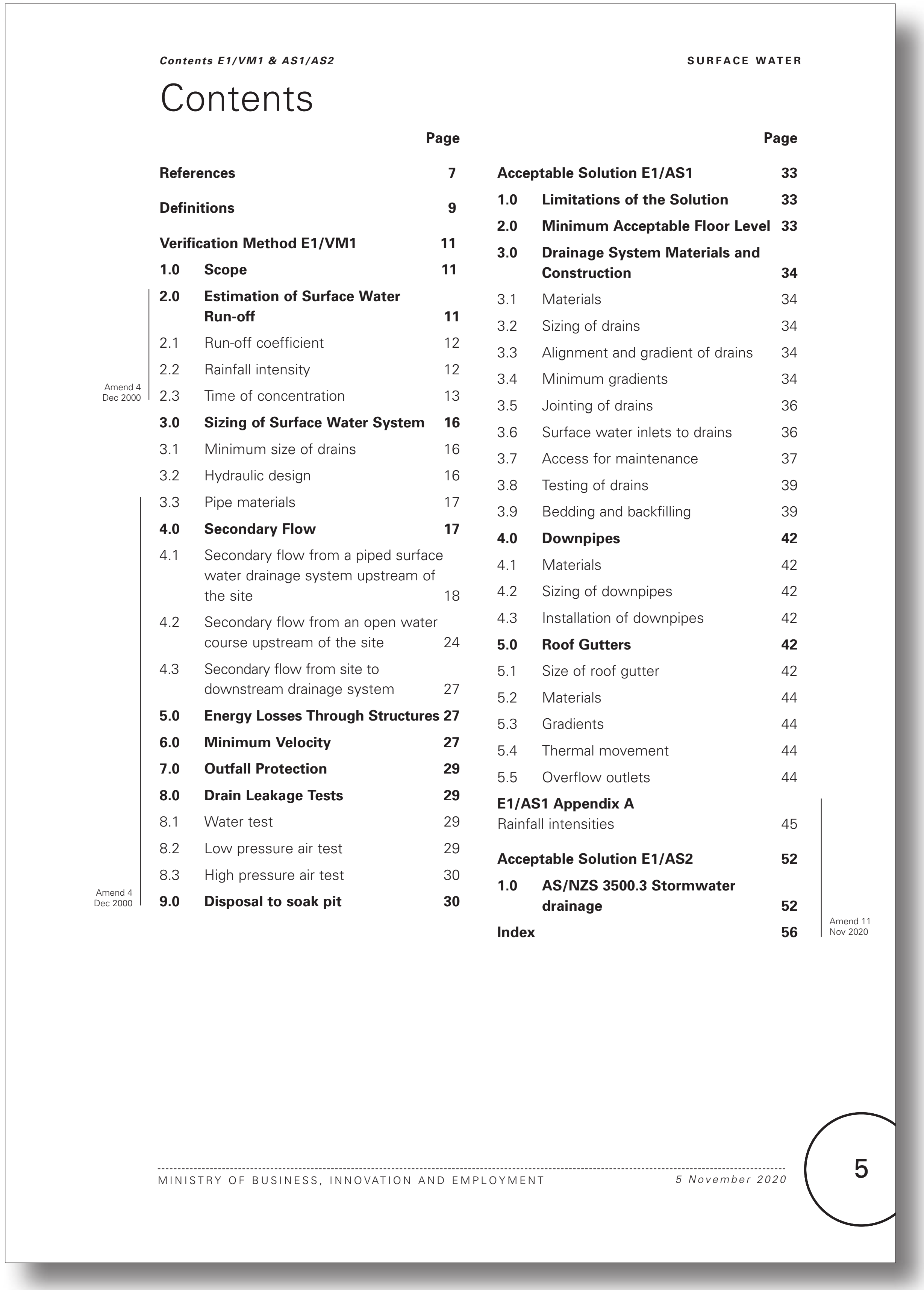
Contents

Amend 4
Dec 2000

Amend 4
Dec 2000

Amend 11
Nov 2020

Proposed E1 Surface Water - No changes proposed to this page



Contents E1/VM1 & AS1/AS2 SURFACE WATER

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Amend 4
Dec 2000

Amend 4
Dec 2000

Amend 11
Nov 2020

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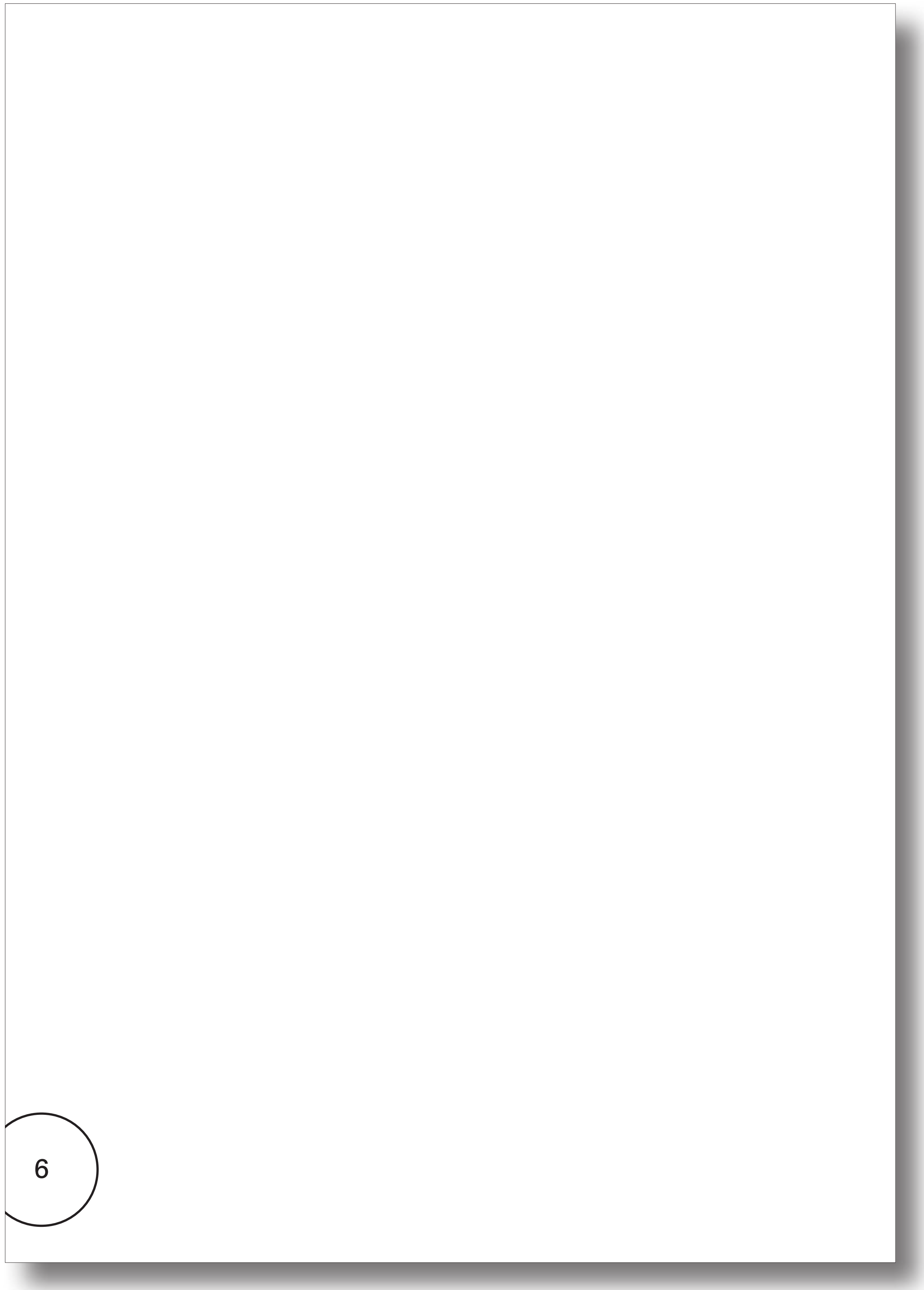
Current E1 Surface Water - No changes proposed to this page



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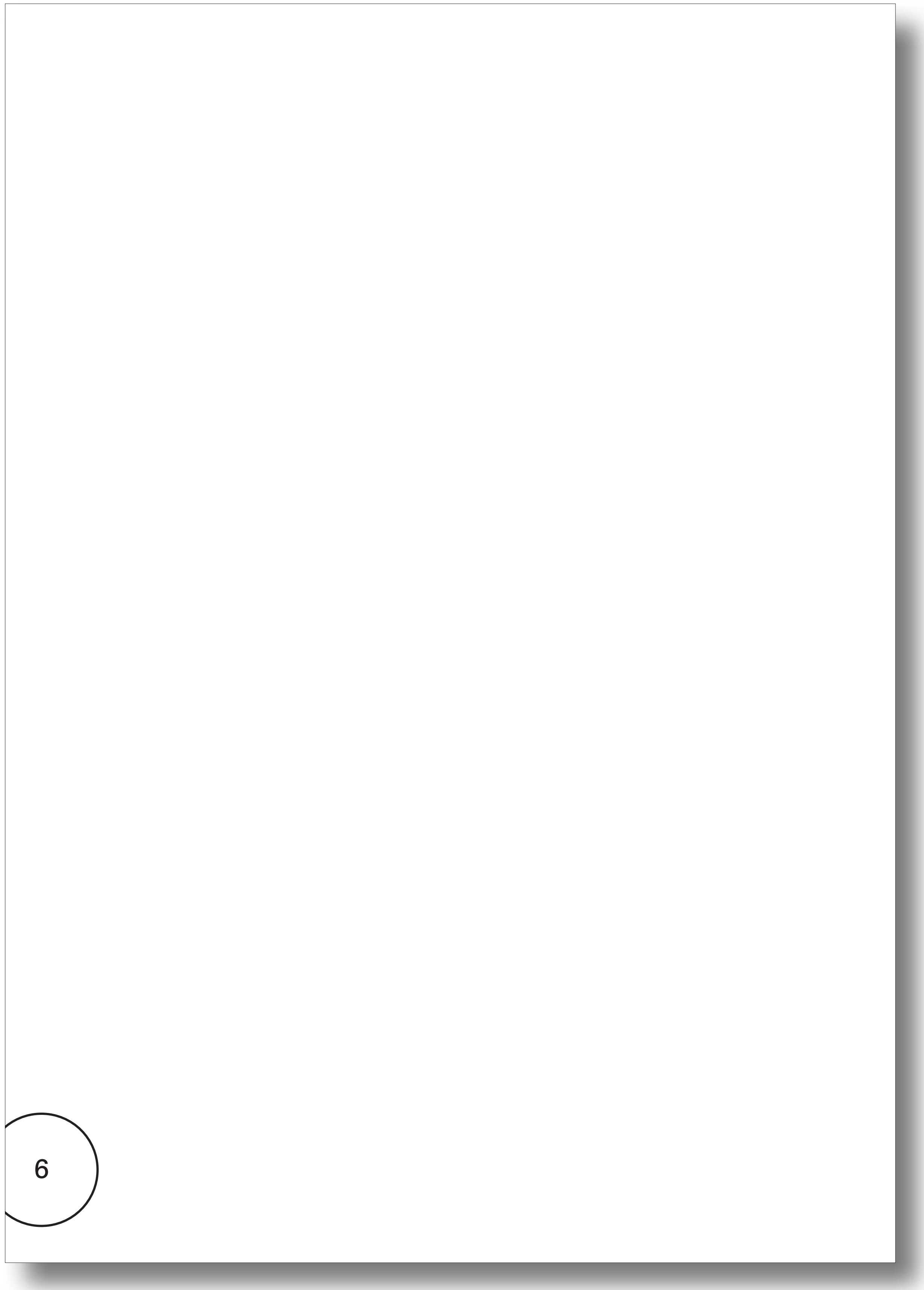

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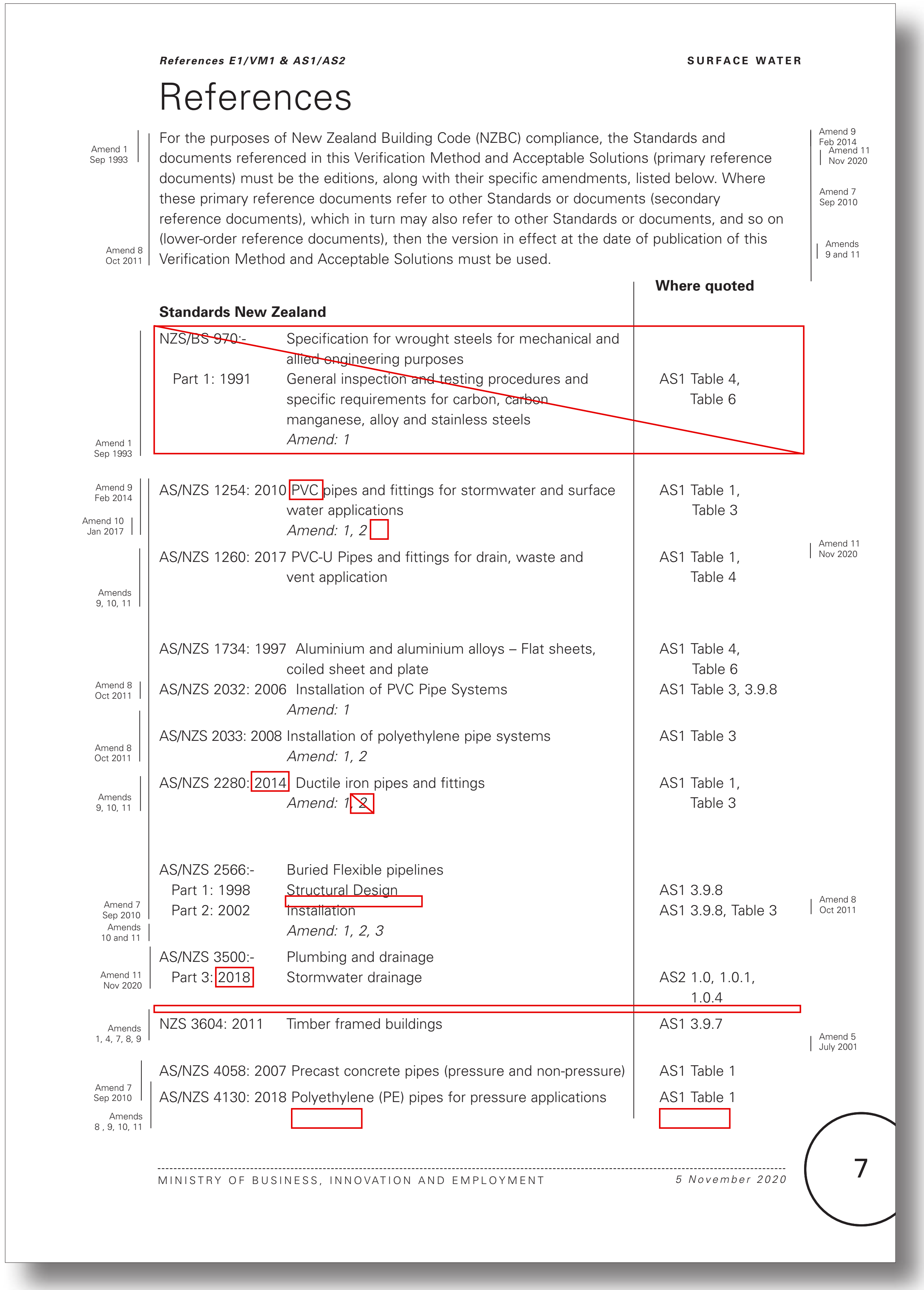
Current E1 Surface Water acceptable solutions and verification methods

(Text to be amended shown in red)



References E1/VM1 & AS1/AS2 SURFACE WATER

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Amend 1 Sep 1993
Amend 8 Oct 2011
Amend 9 Feb 2014
Amend 11 Nov 2020
Amend 7 Sep 2010
Amends 9 and 11

			Where quoted	
	Standards New Zealand			
Amend 1 Sep 1993	~~NZS/BS 970:-~~	~~Specification for wrought steels for mechanical and allied engineering purposes~~		
	~~Part 1: 1991~~	~~General inspection and testing procedures and specific requirements for carbon, carbon manganese, alloy and stainless steels~~ ~~*Amend: 1*~~	~~AS1 Table 4, Table 6~~	
Amend 9 Feb 2014 Amend 10 Jan 2017	AS/NZS 1254: 2010	PVC pipes and fittings for stormwater and surface water applications *Amend: 1, 2*	AS1 Table 1, Table 3	
Amends 9, 10, 11	AS/NZS 1260: 2017	PVC-U Pipes and fittings for drain, waste and vent application	AS1 Table 1, Table 4	Amend 11 Nov 2020
	AS/NZS 1734: 1997	Aluminium and aluminium alloys – Flat sheets, coiled sheet and plate	AS1 Table 4, Table 6	
Amend 8 Oct 2011	AS/NZS 2032: 2006	Installation of PVC Pipe Systems *Amend: 1*	AS1 Table 3, 3.9.8	
Amend 8 Oct 2011	AS/NZS 2033: 2008	Installation of polyethylene pipe systems *Amend: 1, 2*	AS1 Table 3	
Amends 9, 10, 11	AS/NZS 2280: 2014	Ductile iron pipes and fittings *Amend: 1, ~~2~~*	AS1 Table 1, Table 3	
	AS/NZS 2566:-	Buried Flexible pipelines		
	Part 1: 1998	Structural Design	AS1 3.9.8	
Amend 7 Sep 2010 Amends 10 and 11	Part 2: 2002	Installation *Amend: 1, 2, 3*	AS1 3.9.8, Table 3	Amend 8 Oct 2011
	AS/NZS 3500:-	Plumbing and drainage		
Amend 11 Nov 2020	Part 3: 2018	Stormwater drainage	AS2 1.0, 1.0.1, 1.0.4	
Amends 1, 4, 7, 8, 9	NZS 3604: 2011	Timber framed buildings	AS1 3.9.7	Amend 5 July 2001
Amend 7 Sep 2010	AS/NZS 4058: 2007	Precast concrete pipes (pressure and non-pressure)	AS1 Table 1	
Amends 8 , 9, 10, 11	AS/NZS 4130: 2018	Polyethylene (PE) pipes for pressure applications	AS1 Table 1	

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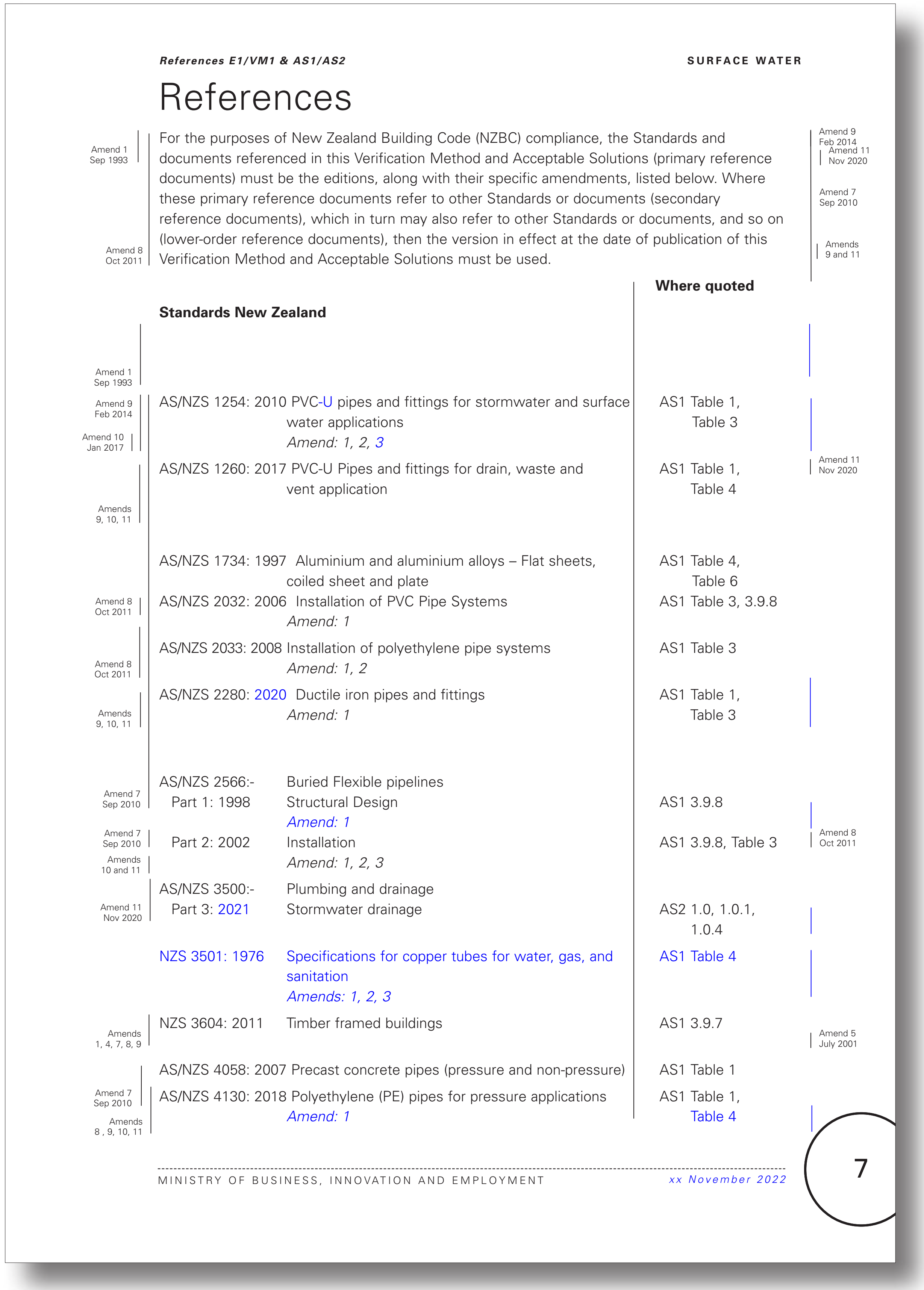
Proposed amendments to E1 Surface Water acceptable solutions and verification methods (Proposed text in blue)



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			Where quoted	
	Standards New Zealand			
Amend 1 Sep 1993				
Amend 9 Feb 2014 Amend 10 Jan 2017	AS/NZS 1254: 2010	PVC-U pipes and fittings for stormwater and surface water applications *Amend: 1, 2, 3*	AS1 Table 1, Table 3	
Amends 9, 10, 11	AS/NZS 1260: 2017	PVC-U Pipes and fittings for drain, waste and vent application	AS1 Table 1, Table 4	Amend 11 Nov 2020
	AS/NZS 1734: 1997	Aluminium and aluminium alloys – Flat sheets, coiled sheet and plate	AS1 Table 4, Table 6	
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	AS/NZS 3500:-	Plumbing and drainage		
Amend 11 Nov 2020	Part 3: 2021	Stormwater drainage	AS2 1.0, 1.0.1, 1.0.4	
	NZS 3501: 1976	Specifications for copper tubes for water, gas, and sanitation *Amends: 1, 2, 3*	AS1 Table 4	
Amends 1, 4, 7, 8, 9	NZS 3604: 2011	Timber framed buildings	AS1 3.9.7	Amend 5 July 2001
Amend 7 Sep 2010	AS/NZS 4058: 2007	Precast concrete pipes (pressure and non-pressure)	AS1 Table 1	
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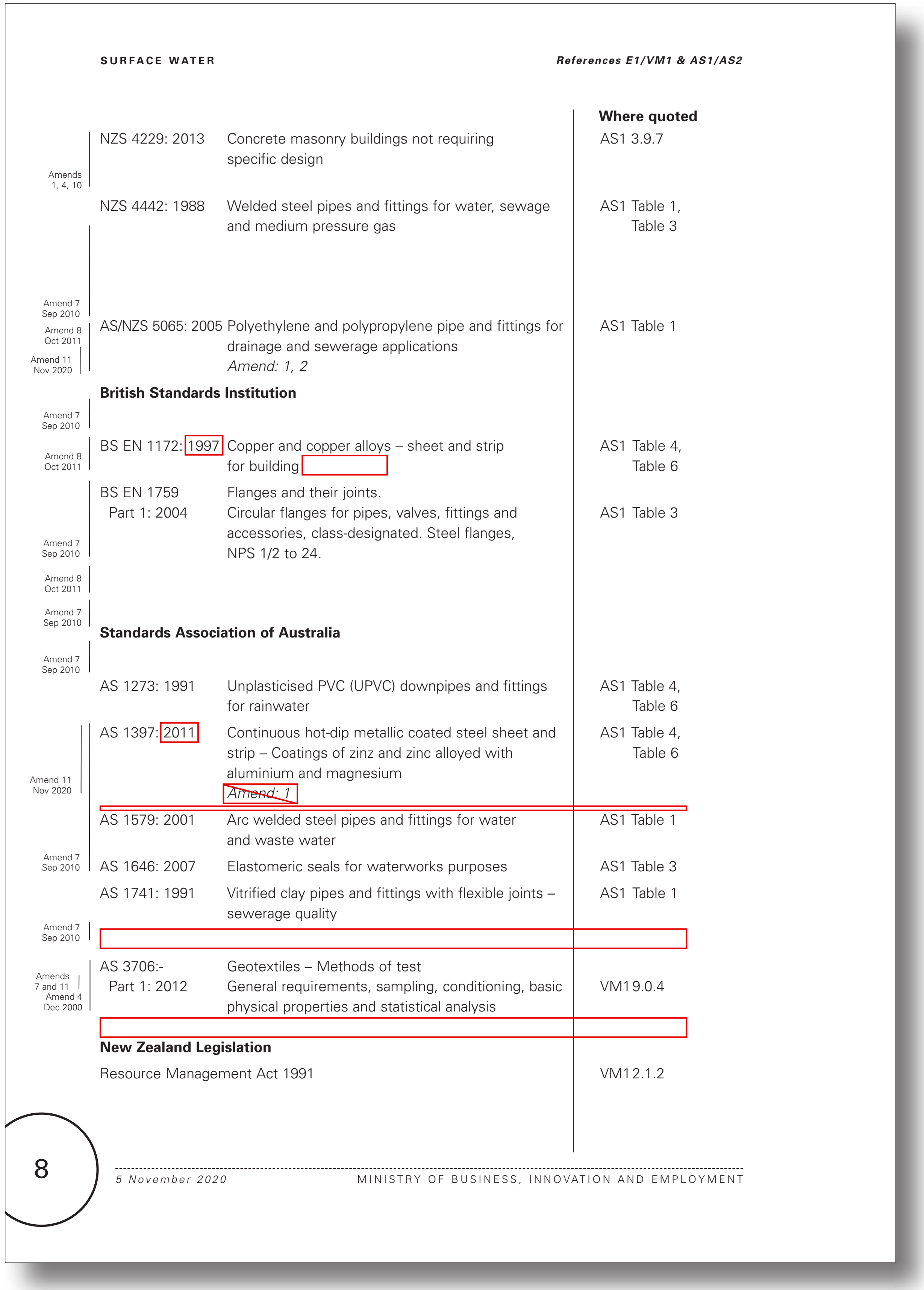
Appendix A. Proposed changes to the acceptable solutions and verification methods for clause E1 Surface Water

Current E1 Surface Water acceptable solutions and verification methods

(Text to be amended shown in red)



SURFACE WATER

References E1/VM1 & AS1/AS2

			Where quoted
Amends 1, 4, 10	NZS 4229: 2013	Concrete masonry buildings not requiring specific design	AS1 3.9.7
	NZS 4442: 1988	Welded steel pipes and fittings for water, sewage and medium pressure gas	AS1 Table 1, Table 3
Amend 7 Sep 2010 Amend 8 Oct 2011 Amend 11 Nov 2020	AS/NZS 5065: 2005	Polyethylene and polypropylene pipe and fittings for drainage and sewerage applications *Amend: 1, 2*	AS1 Table 1
	British Standards Institution		
Amend 7 Sep 2010 Amend 8 Oct 2011	BS EN 1172: 1997	Copper and copper alloys – sheet and strip for building	AS1 Table 4, Table 6
	BS EN 1759 Part 1: 2004	Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, class-designated. Steel flanges, NPS 1/2 to 24.	AS1 Table 3
Amend 7 Sep 2010 Amend 8 Oct 2011 Amend 7 Sep 2010	**Standards Association of Australia**		
Amend 7 Sep 2010	AS 1273: 1991	Unplasticised PVC (UPVC) downpipes and fittings for rainwater	AS1 Table 4, Table 6
Amend 11 Nov 2020	AS 1397: 2011	Continuous hot-dip metallic coated steel sheet and strip – Coatings of zinz and zinc alloyed with aluminium and magnesium ~~*Amend: 1*~~	AS1 Table 4, Table 6
	AS 1579: 2001	Arc welded steel pipes and fittings for water and waste water	AS1 Table 1
Amend 7 Sep 2010	AS 1646: 2007	Elastomeric seals for waterworks purposes	AS1 Table 3
	AS 1741: 1991	Vitrified clay pipes and fittings with flexible joints – sewerage quality	AS1 Table 1
Amend 7 Sep 2010			
Amends 7 and 11 Amend 4 Dec 2000	AS 3706:- Part 1: 2012	Geotextiles – Methods of test General requirements, sampling, conditioning, basic physical properties and statistical analysis	VM1 9.0.4
	New Zealand Legislation		
	Resource Management Act 1991		VM1 2.1.2

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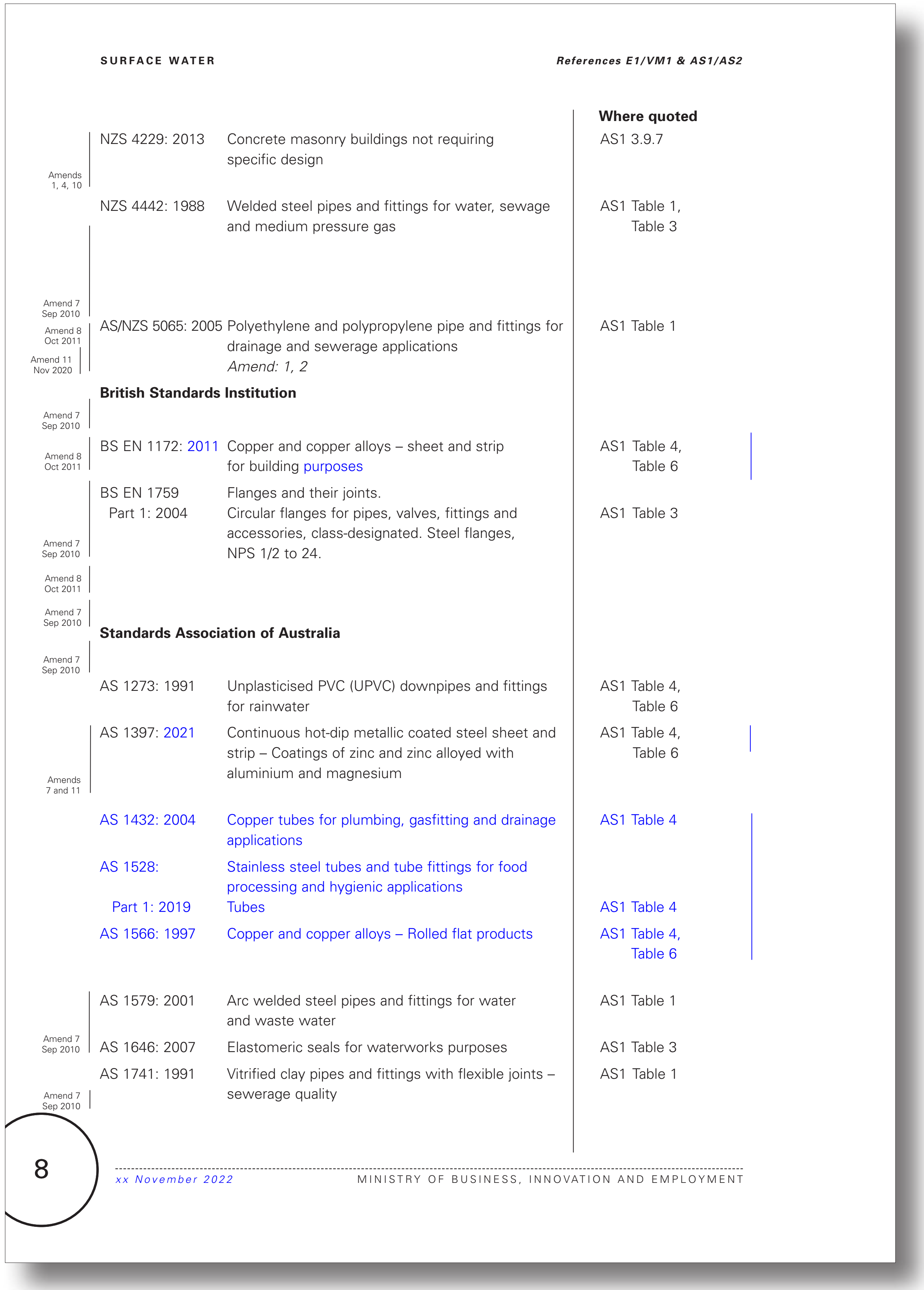
5 November 2020 MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Proposed amendments to E1 Surface Water acceptable solutions and verification methods

(Proposed text in blue)



SURFACE WATER

References E1/VM1 & AS1/AS2

			Where quoted
Amends 1, 4, 10	NZS 4229: 2013	Concrete masonry buildings not requiring specific design	AS1 3.9.7
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	AS 1432: 2004	Copper tubes for plumbing, gasfitting and drainage applications	AS1 Table 4
	AS 1528: Part 1: 2019	Stainless steel tubes and tube fittings for food processing and hygienic applications Tubes	AS1 Table 4
	AS 1566: 1997	Copper and copper alloys – Rolled flat products	AS1 Table 4, Table 6
	AS 1579: 2001	Arc welded steel pipes and fittings for water and waste water	AS1 Table 1
Amend 7 Sep 2010	AS 1646: 2007	Elastomeric seals for waterworks purposes	AS1 Table 3
	AS 1741: 1991	Vitrified clay pipes and fittings with flexible joints – sewerage quality	AS1 Table 1
Amend 7 Sep 2010			

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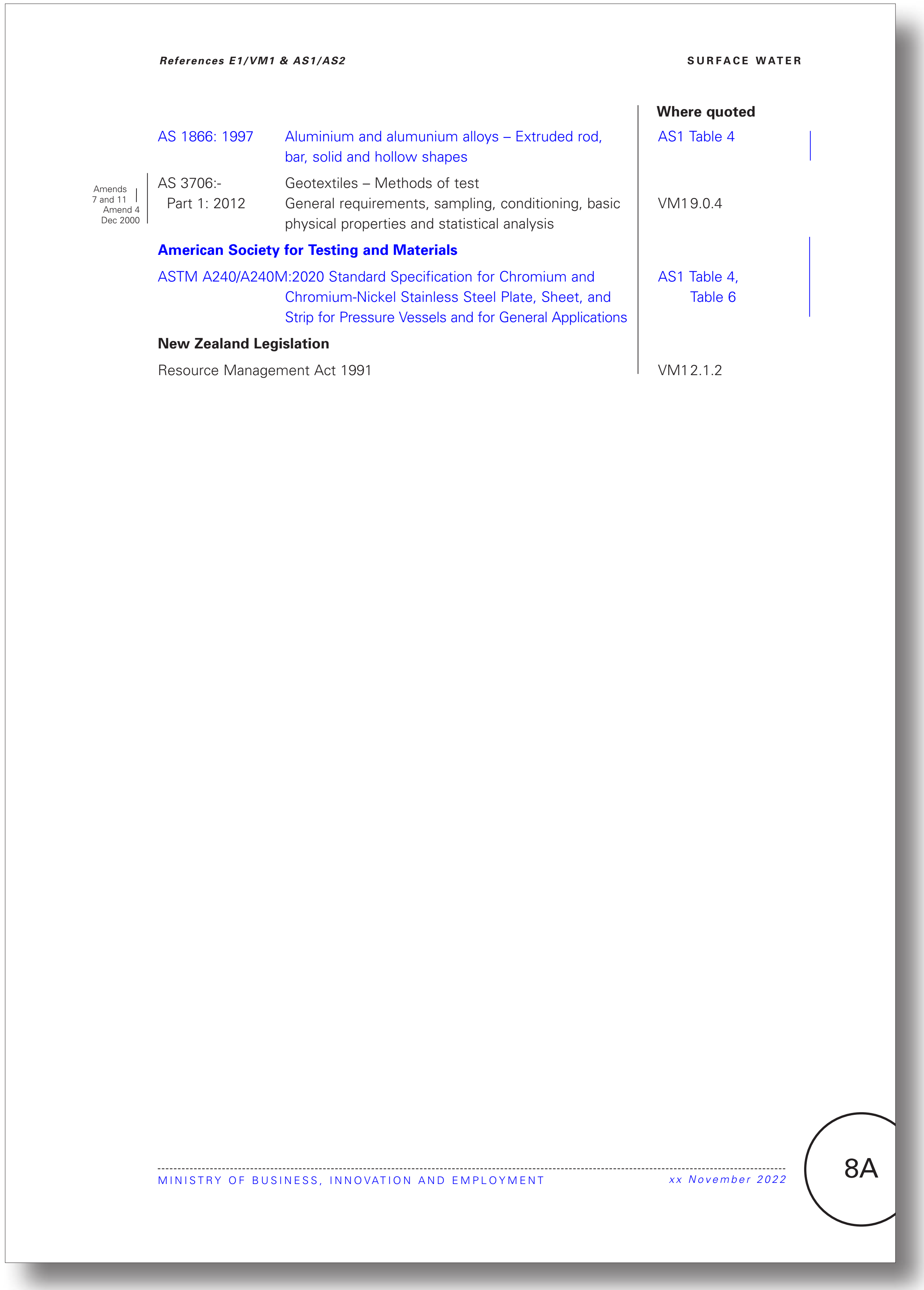
xx November 2022 MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Current E1 Surface Water acceptable solutions and verification methods
(Text to be amended shown in red)

Proposed amendments to E1 Surface Water acceptable solutions and verification methods (Proposed text in blue)



References E1/VM1 & AS1/AS2 SURFACE WATER

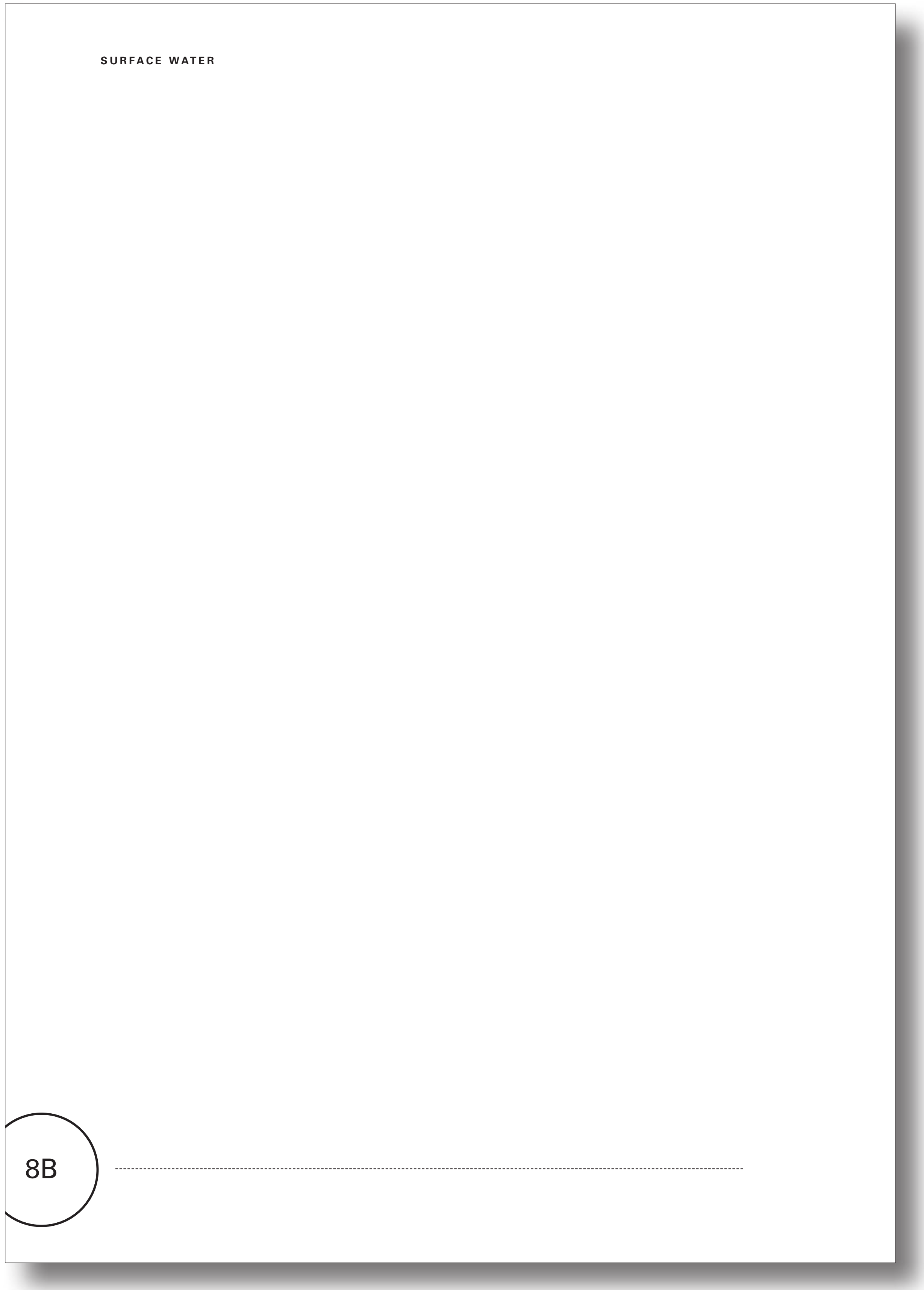
		Where quoted
AS 1866: 1997	Aluminium and alumunium alloys – Extruded rod, bar, solid and hollow shapes	AS1 Table 4
AS 3706:- Part 1: 2012	Geotextiles – Methods of test General requirements, sampling, conditioning, basic physical properties and statistical analysis	VM1 9.0.4
American Society for Testing and Materials		
ASTM A240/A240M:2020	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications	AS1 Table 4, Table 6
New Zealand Legislation		
Resource Management Act 1991		VM1 2.1.2

Amends 7 and 11 Amend 4 Dec 2000

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT *xx November 2022* 8A

Current E1 Surface Water acceptable solutions and verification methods

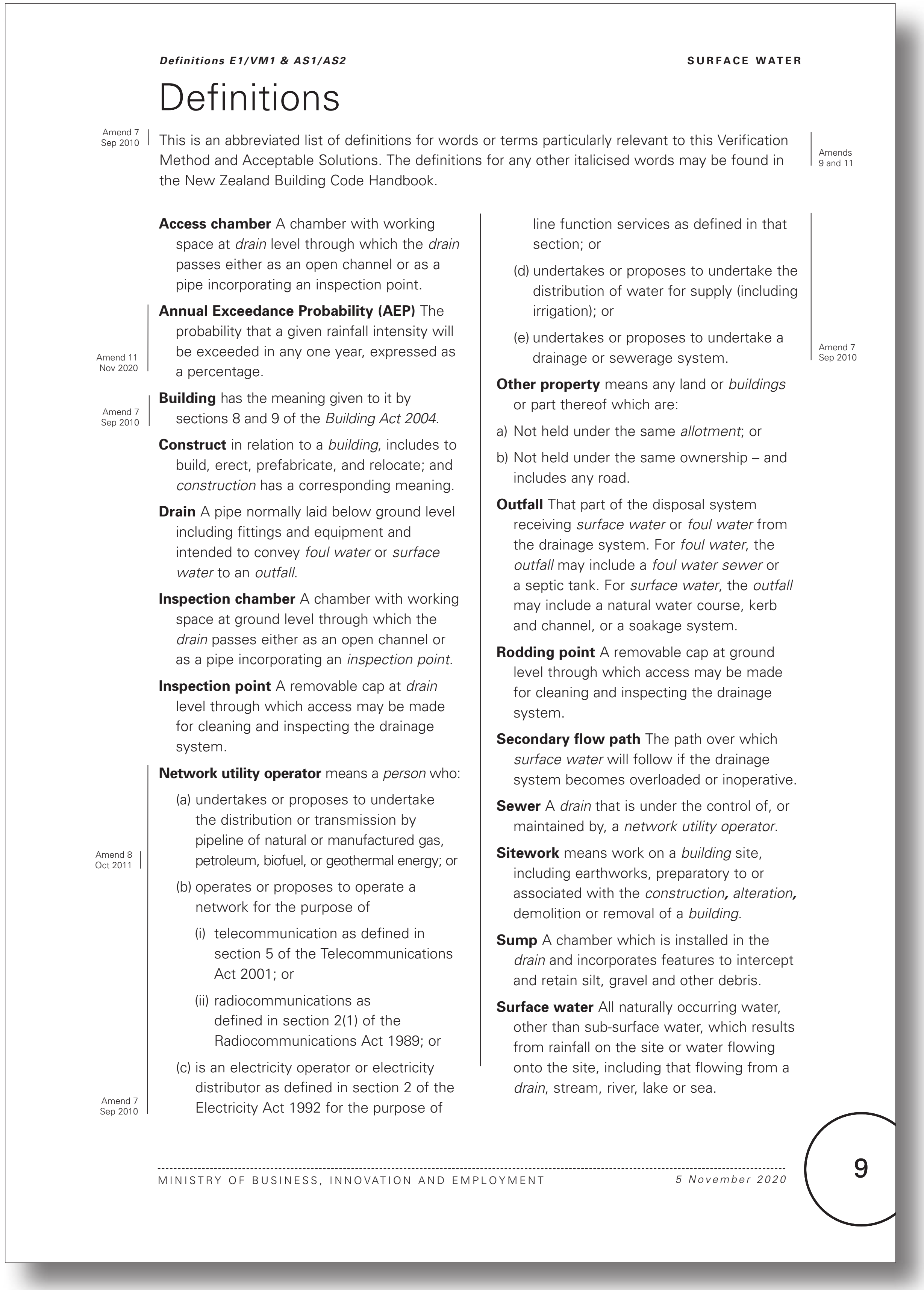
Proposed amendments to E1 Surface Water acceptable solutions and verification methods



SURFACE WATER

8B

Current E1 Surface Water - No changes proposed to this page



Definitions

Amend 7 Sep 2010

This is an abbreviated list of definitions for words or terms particularly relevant to this Verification Method and Acceptable Solutions. The definitions for any other italicised words may be found in the New Zealand Building Code Handbook.

Amends 9 and 11

Access chamber A chamber with working space at *drain* level through which the *drain* passes either as an open channel or as a pipe incorporating an inspection point.

Amend 11 Nov 2020

Annual Exceedance Probability (AEP) The probability that a given rainfall intensity will be exceeded in any one year, expressed as a percentage.

Amend 7 Sep 2010

Building has the meaning given to it by sections 8 and 9 of the *Building Act 2004.*

Construct in relation to a *building*, includes to build, erect, prefabricate, and relocate; and *construction* has a corresponding meaning.

Drain A pipe normally laid below ground level including fittings and equipment and intended to convey *foul water* or *surface water* to an *outfall.*

Inspection chamber A chamber with working space at ground level through which the *drain* passes either as an open channel or as a pipe incorporating an *inspection point.*

Inspection point A removable cap at *drain* level through which access may be made for cleaning and inspecting the drainage system.

Amend 8 Oct 2011

Amend 7 Sep 2010

Network utility operator means a *person* who:

(a) undertakes or proposes to undertake the distribution or transmission by pipeline of natural or manufactured gas, petroleum, biofuel, or geothermal energy; or

(b) operates or proposes to operate a network for the purpose of

(i) telecommunication as defined in section 5 of the Telecommunications Act 2001; or

(ii) radiocommunications as defined in section 2(1) of the Radiocommunications Act 1989; or

(c) is an electricity operator or electricity distributor as defined in section 2 of the Electricity Act 1992 for the purpose of line function services as defined in that section; or

(d) undertakes or proposes to undertake the distribution of water for supply (including irrigation); or

(e) undertakes or proposes to undertake a drainage or sewerage system.

Amend 7 Sep 2010

Other property means any land or *buildings* or part thereof which are:

a) Not held under the same *allotment*; or

b) Not held under the same ownership – and includes any road.

Outfall That part of the disposal system receiving *surface water* or *foul water* from the drainage system. For *foul water*, the *outfall* may include a *foul water sewer* or a septic tank. For *surface water*, the *outfall* may include a natural water course, kerb and channel, or a soakage system.

Rodding point A removable cap at ground level through which access may be made for cleaning and inspecting the drainage system.

Secondary flow path The path over which *surface water* will follow if the drainage system becomes overloaded or inoperative.

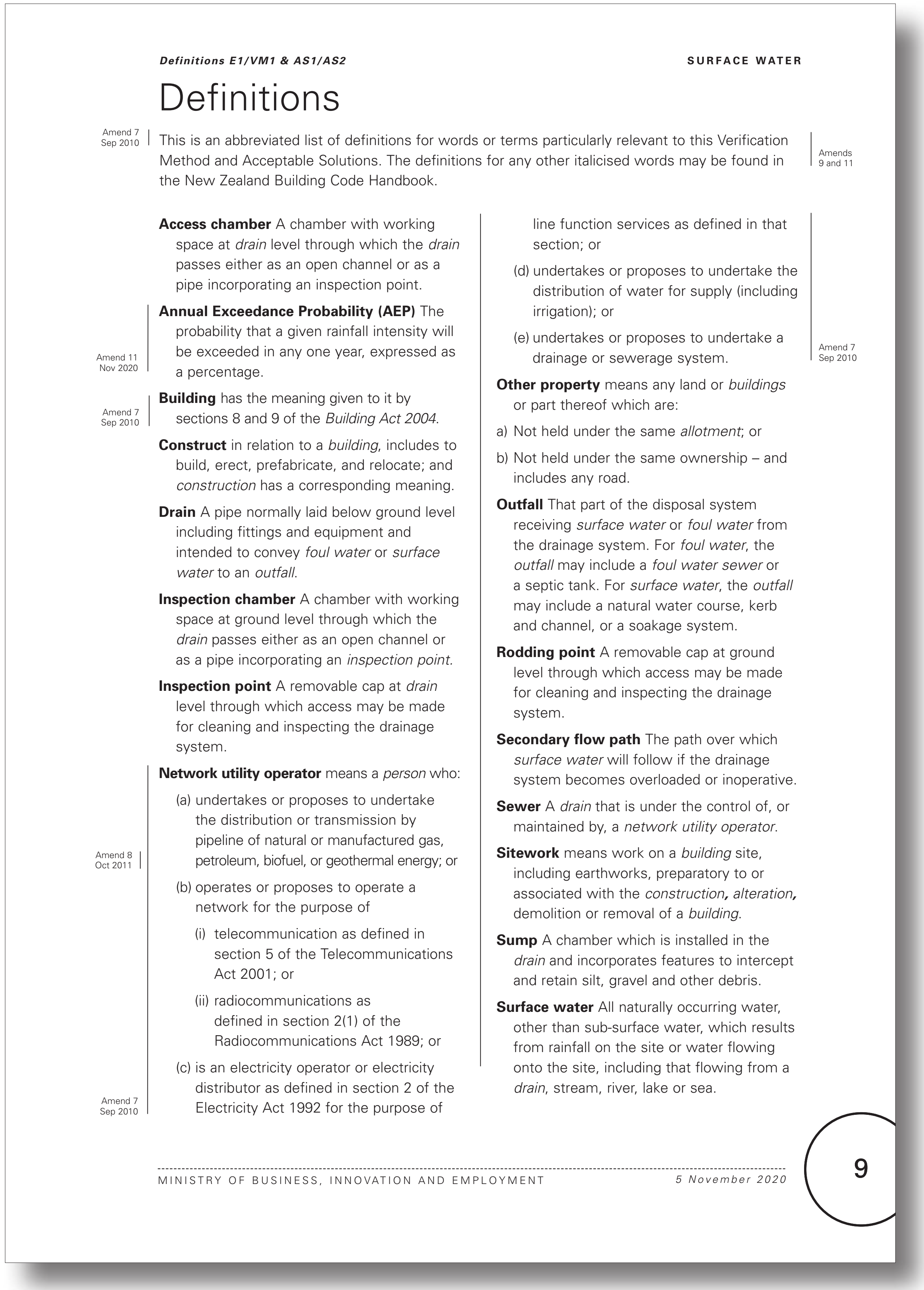
Sewer A *drain* that is under the control of, or maintained by, a *network utility operator.*

Sitework means work on a *building* site, including earthworks, preparatory to or associated with the *construction, alteration,* demolition or removal of a *building.*

Sump A chamber which is installed in the *drain* and incorporates features to intercept and retain silt, gravel and other debris.

Surface water All naturally occurring water, other than sub-surface water, which results from rainfall on the site or water flowing onto the site, including that flowing from a *drain*, stream, river, lake or sea.

Proposed E1 Surface Water - No changes proposed to this page



Definitions E1/VM1 & AS1/AS2 SURFACE WATER

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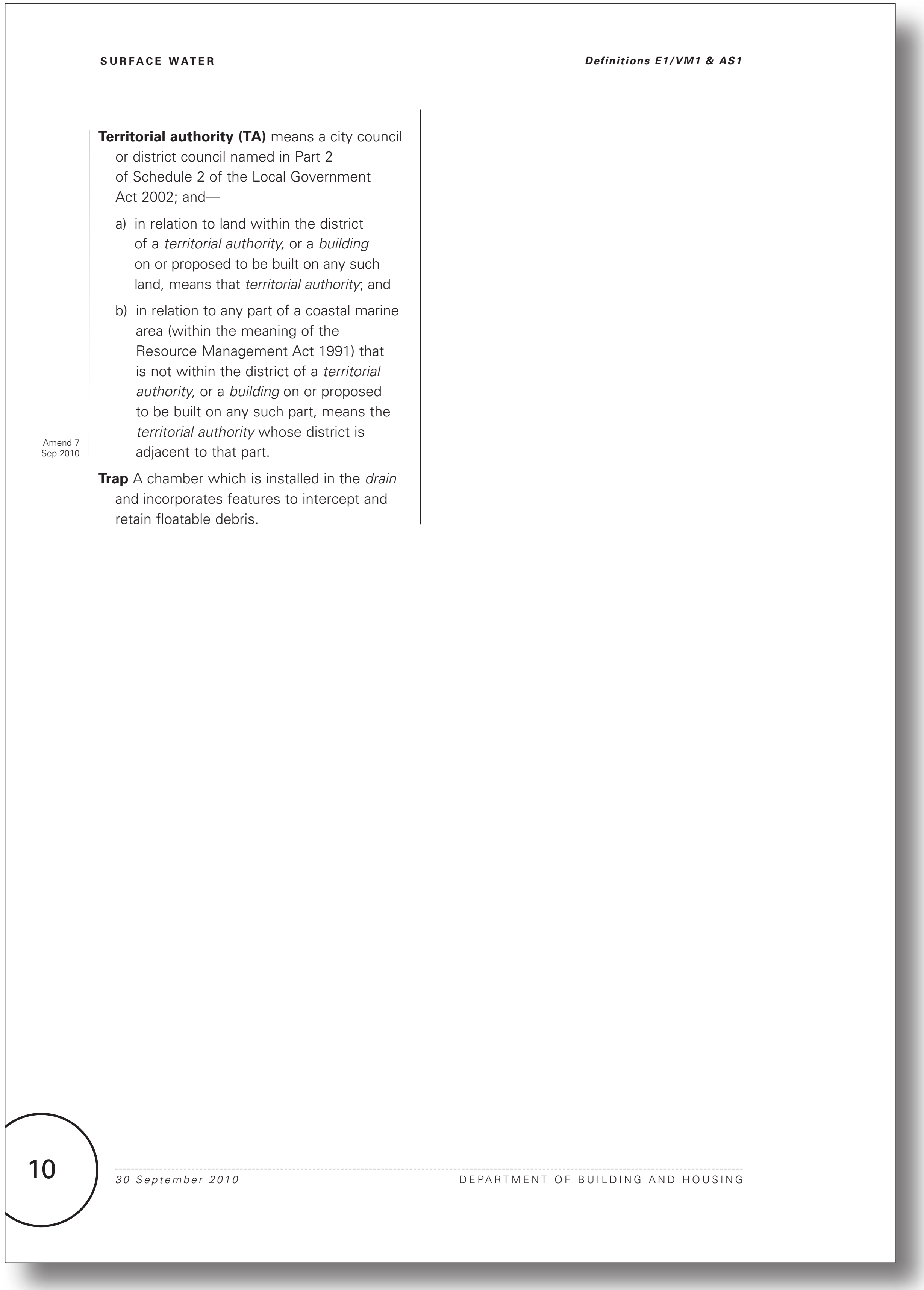
MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT 5 November 2020 9

Current E1 Surface Water - No changes proposed to this page



Territorial authority (TA) means a city council or district council named in Part 2 of Schedule 2 of the Local Government Act 2002; and—

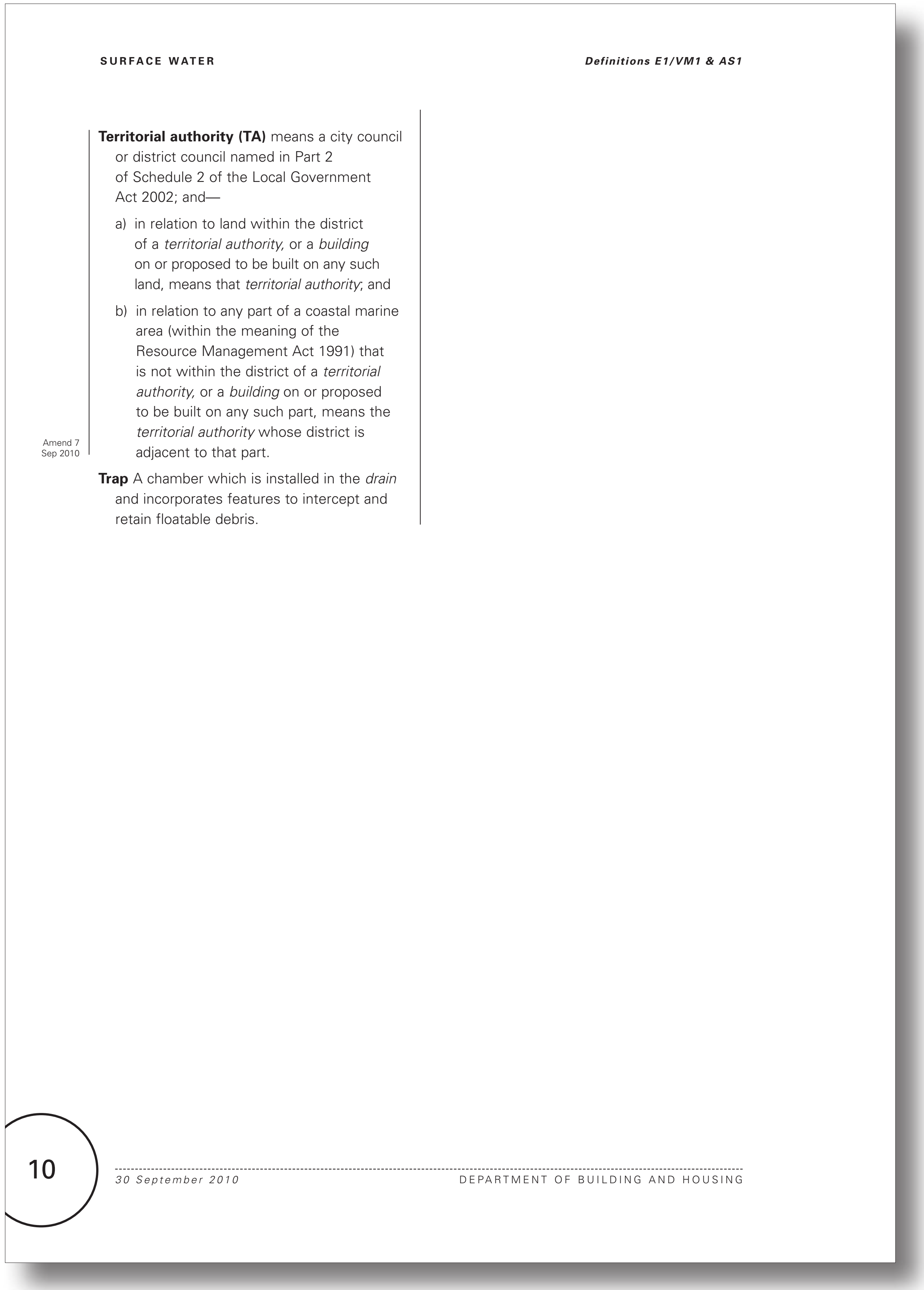
a) in relation to land within the district of a *territorial authority*, or a *building* on or proposed to be built on any such land, means that *territorial authority*; and

b) in relation to any part of a coastal marine area (within the meaning of the Resource Management Act 1991) that is not within the district of a *territorial authority*, or a *building* on or proposed to be built on any such part, means the *territorial authority* whose district is adjacent to that part.

Amend 7
Sep 2010

Trap A chamber which is installed in the *drain* and incorporates features to intercept and retain floatable debris.

Proposed E1 Surface Water - No changes proposed to this page



SURFACE WATER

Definitions E1/VM1 & AS1

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Amend 7
Sep 2010

Trap A chamber which is installed in the *drain* and incorporates features to intercept and retain floatable debris.

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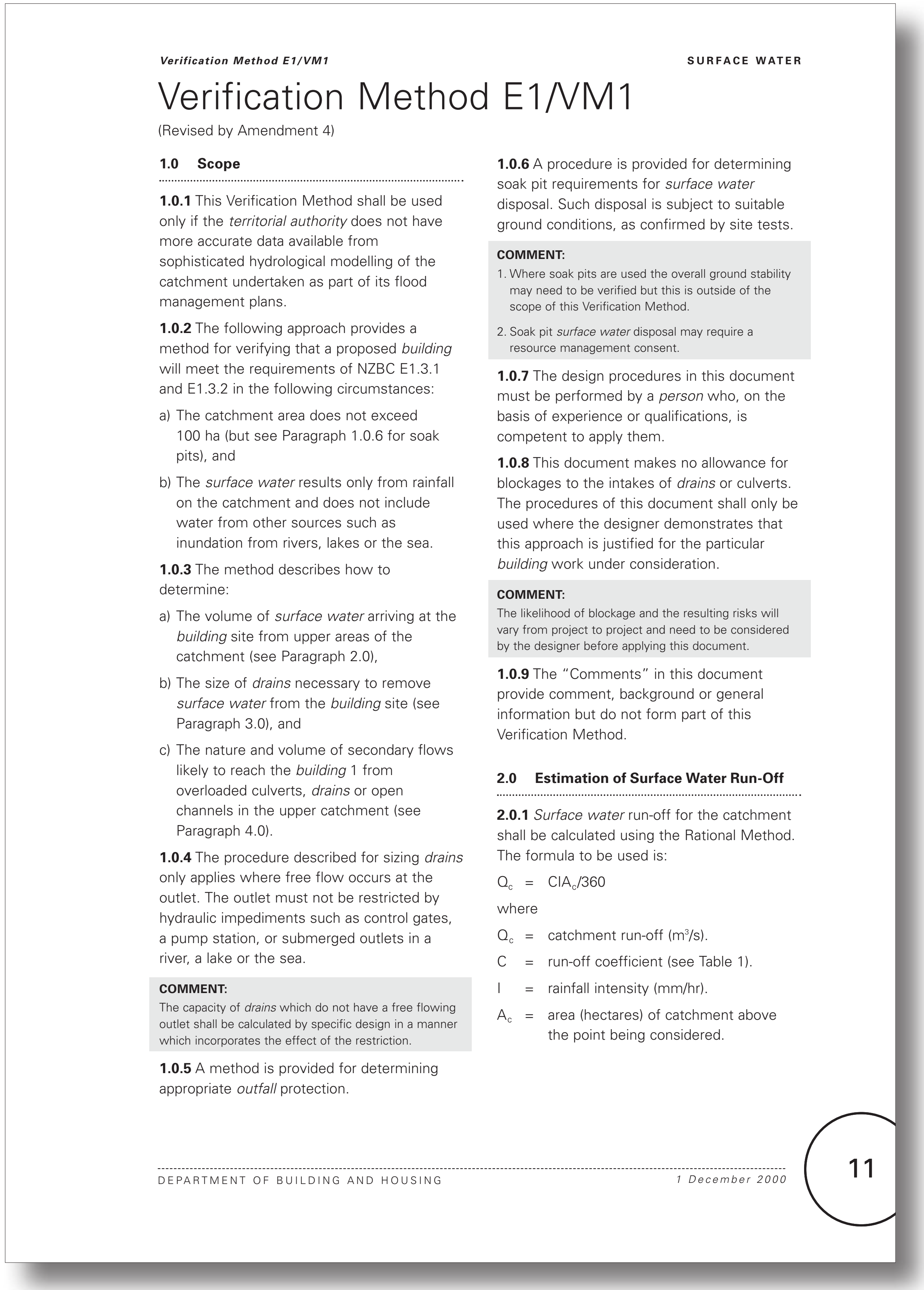
30 September 2010

DEPARTMENT OF BUILDING AND HOUSING

Current E1 Surface Water - No changes proposed to this page



Verification Method E1/VM1 SURFACE WATER

Verification Method E1/VM1

(Revised by Amendment 4)

1.0 Scope

1.0.1 This Verification Method shall be used only if the *territorial authority* does not have more accurate data available from sophisticated hydrological modelling of the catchment undertaken as part of its flood management plans.

1.0.2 The following approach provides a method for verifying that a proposed *building* will meet the requirements of NZBC E1.3.1 and E1.3.2 in the following circumstances:

a) The catchment area does not exceed 100 ha (but see Paragraph 1.0.6 for soak pits), and

b) The *surface water* results only from rainfall on the catchment and does not include water from other sources such as inundation from rivers, lakes or the sea.

1.0.3 The method describes how to determine:

a) The volume of *surface water* arriving at the *building* site from upper areas of the catchment (see Paragraph 2.0),

b) The size of *drains* necessary to remove *surface water* from the *building* site (see Paragraph 3.0), and

c) The nature and volume of secondary flows likely to reach the *building* 1 from overloaded culverts, *drains* or open channels in the upper catchment (see Paragraph 4.0).

1.0.4 The procedure described for sizing *drains* only applies where free flow occurs at the outlet. The outlet must not be restricted by hydraulic impediments such as control gates, a pump station, or submerged outlets in a river, a lake or the sea.

COMMENT:

The capacity of *drains* which do not have a free flowing outlet shall be calculated by specific design in a manner which incorporates the effect of the restriction.

1.0.5 A method is provided for determining appropriate *outfall* protection.

1.0.6 A procedure is provided for determining soak pit requirements for *surface water* disposal. Such disposal is subject to suitable ground conditions, as confirmed by site tests.

COMMENT:

1. Where soak pits are used the overall ground stability may need to be verified but this is outside of the scope of this Verification Method.
2. Soak pit *surface water* disposal may require a resource management consent.

1.0.7 The design procedures in this document must be performed by a *person* who, on the basis of experience or qualifications, is competent to apply them.

1.0.8 This document makes no allowance for blockages to the intakes of *drains* or culverts. The procedures of this document shall only be used where the designer demonstrates that this approach is justified for the particular *building* work under consideration.

COMMENT:

The likelihood of blockage and the resulting risks will vary from project to project and need to be considered by the designer before applying this document.

1.0.9 The "Comments" in this document provide comment, background or general information but do not form part of this Verification Method.

2.0 Estimation of Surface Water Run-Off

2.0.1 *Surface water* run-off for the catchment shall be calculated using the Rational Method. The formula to be used is:

$Q_c = CIA_c/360$

where

Q_c = catchment run-off (m^3/s).

C = run-off coefficient (see Table 1).

I = rainfall intensity (mm/hr).

A_c = area (hectares) of catchment above the point being considered.

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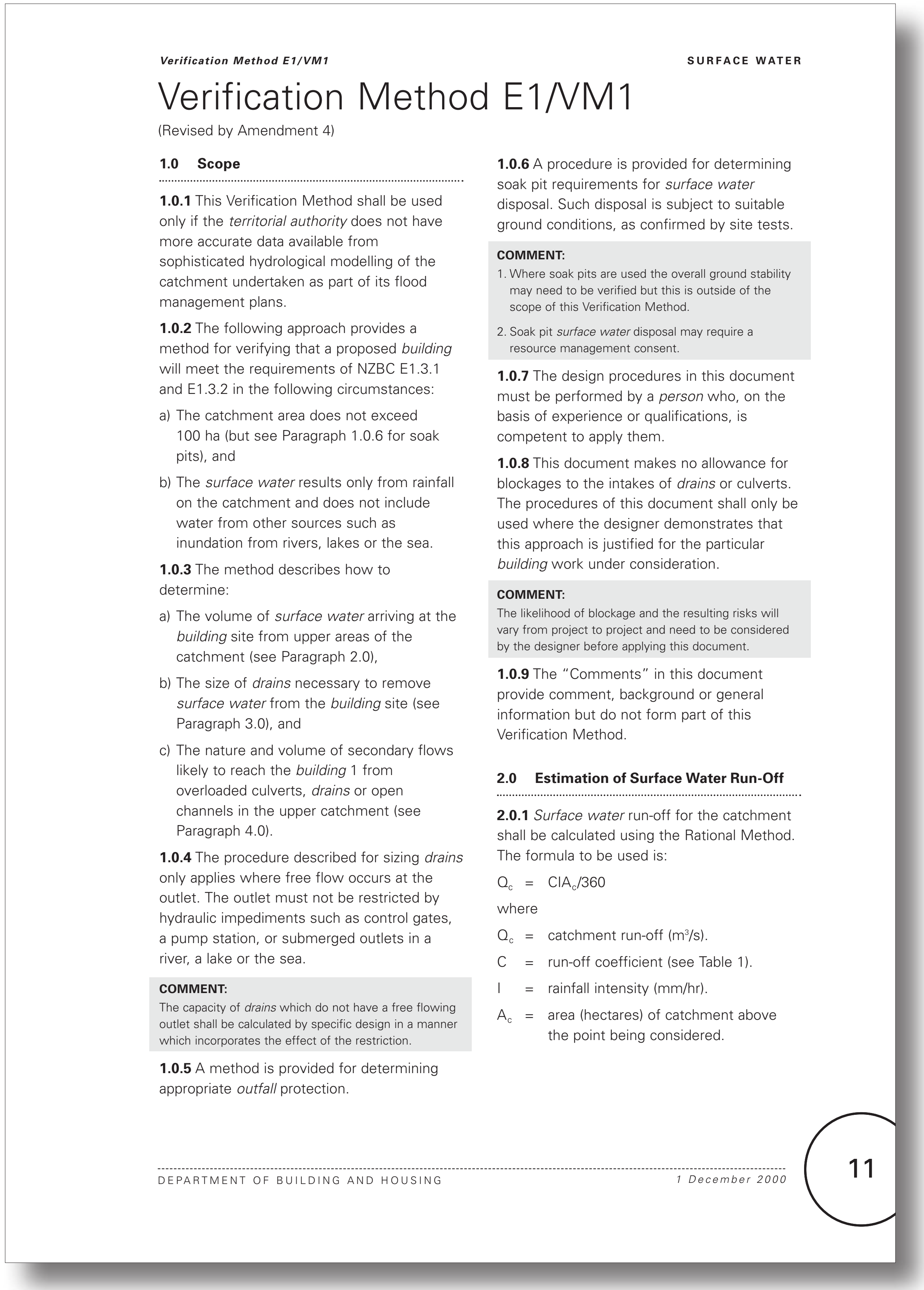
Proposed E1 Surface Water - No changes proposed to this page



Verification Method E1/VM1 SURFACE WATER

Verification Method E1/VM1

(Revised by Amendment 4)

1.0 Scope

1.0.1 This Verification Method shall be used only if the *territorial authority* does not have more accurate data available from sophisticated hydrological modelling of the catchment undertaken as part of its flood management plans.

1.0.2 The following approach provides a method for verifying that a proposed *building* will meet the requirements of NZBC E1.3.1 and E1.3.2 in the following circumstances:

a) The catchment area does not exceed 100 ha (but see Paragraph 1.0.6 for soak pits), and

b) The *surface water* results only from rainfall on the catchment and does not include water from other sources such as inundation from rivers, lakes or the sea.

1.0.3 The method describes how to determine:

a) The volume of *surface water* arriving at the *building* site from upper areas of the catchment (see Paragraph 2.0),

b) The size of *drains* necessary to remove *surface water* from the *building* site (see Paragraph 3.0), and

c) The nature and volume of secondary flows likely to reach the *building* 1 from overloaded culverts, *drains* or open channels in the upper catchment (see Paragraph 4.0).

1.0.4 The procedure described for sizing *drains* only applies where free flow occurs at the outlet. The outlet must not be restricted by hydraulic impediments such as control gates, a pump station, or submerged outlets in a river, a lake or the sea.

COMMENT:

The capacity of *drains* which do not have a free flowing outlet shall be calculated by specific design in a manner which incorporates the effect of the restriction.

1.0.5 A method is provided for determining appropriate *outfall* protection.

1.0.6 A procedure is provided for determining soak pit requirements for *surface water* disposal. Such disposal is subject to suitable ground conditions, as confirmed by site tests.

COMMENT:

1. Where soak pits are used the overall ground stability may need to be verified but this is outside of the scope of this Verification Method.
2. Soak pit *surface water* disposal may require a resource management consent.

1.0.7 The design procedures in this document must be performed by a *person* who, on the basis of experience or qualifications, is competent to apply them.

1.0.8 This document makes no allowance for blockages to the intakes of *drains* or culverts. The procedures of this document shall only be used where the designer demonstrates that this approach is justified for the particular *building* work under consideration.

COMMENT:

The likelihood of blockage and the resulting risks will vary from project to project and need to be considered by the designer before applying this document.

1.0.9 The "Comments" in this document provide comment, background or general information but do not form part of this Verification Method.

2.0 Estimation of Surface Water Run-Off

2.0.1 *Surface water* run-off for the catchment shall be calculated using the Rational Method. The formula to be used is:

$Q_c = CIA_c/360$

where

Q_c = catchment run-off (m^3/s).

C = run-off coefficient (see Table 1).

I = rainfall intensity (mm/hr).

A_c = area (hectares) of catchment above the point being considered.

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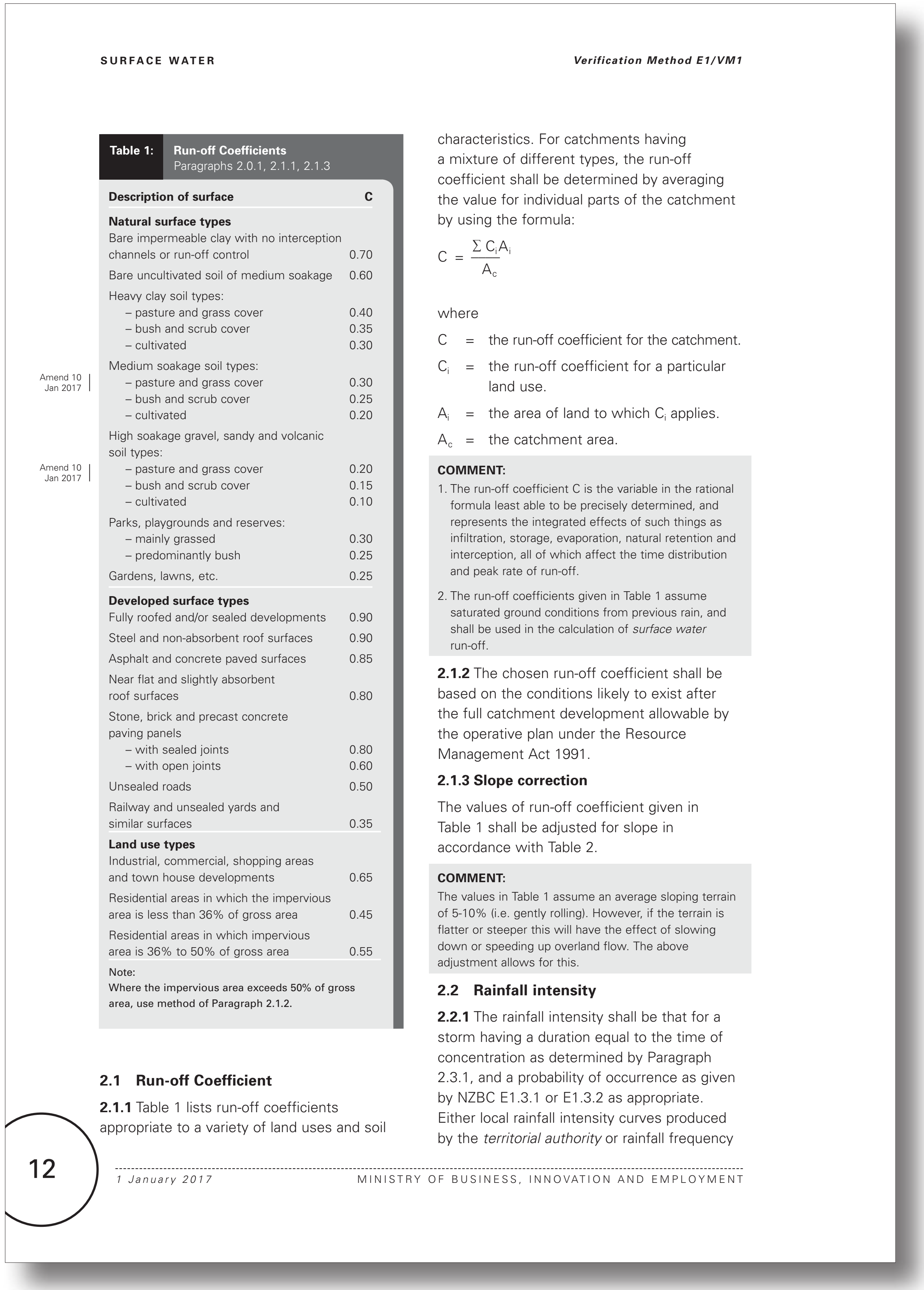

Table 1: Run-off Coefficients
Paragraphs 2.0.1, 2.1.1, 2.1.3

Amend 10 Jan 2017

Amend 10 Jan 2017

Description of surface	C
Natural surface types	
Bare impermeable clay with no interception channels or run-off control	0.70
Bare uncultivated soil of medium soakage	0.60
Heavy clay soil types:	
– pasture and grass cover	0.40
– bush and scrub cover	0.35
– cultivated	0.30
Medium soakage soil types:	
– pasture and grass cover	0.30
– bush and scrub cover	0.25
– cultivated	0.20
High soakage gravel, sandy and volcanic soil types:	
– pasture and grass cover	0.20
– bush and scrub cover	0.15
– cultivated	0.10
Parks, playgrounds and reserves:	
– mainly grassed	0.30
– predominantly bush	0.25
Gardens, lawns, etc.	0.25
Developed surface types	
Fully roofed and/or sealed developments	0.90
Steel and non-absorbent roof surfaces	0.90
Asphalt and concrete paved surfaces	0.85
Near flat and slightly absorbent roof surfaces	0.80
Stone, brick and precast concrete paving panels	
– with sealed joints	0.80
– with open joints	0.60
Unsealed roads	0.50
Railway and unsealed yards and similar surfaces	0.35
Land use types	
Industrial, commercial, shopping areas and town house developments	0.65
Residential areas in which the impervious area is less than 36% of gross area	0.45
Residential areas in which impervious area is 36% to 50% of gross area	0.55

Note:
Where the impervious area exceeds 50% of gross area, use method of Paragraph 2.1.2.

2.1 Run-off Coefficient

2.1.1 Table 1 lists run-off coefficients appropriate to a variety of land uses and soil characteristics. For catchments having a mixture of different types, the run-off coefficient shall be determined by averaging the value for individual parts of the catchment by using the formula:

$$C = \frac{\sum C_i A_i}{A_c}$$

where

C = the run-off coefficient for the catchment.

C_i = the run-off coefficient for a particular land use.

A_i = the area of land to which C_i applies.

A_c = the catchment area.

COMMENT:

1. The run-off coefficient C is the variable in the rational formula least able to be precisely determined, and represents the integrated effects of such things as infiltration, storage, evaporation, natural retention and interception, all of which affect the time distribution and peak rate of run-off.
2. The run-off coefficients given in Table 1 assume saturated ground conditions from previous rain, and shall be used in the calculation of *surface water* run-off.

2.1.2 The chosen run-off coefficient shall be based on the conditions likely to exist after the full catchment development allowable by the operative plan under the Resource Management Act 1991.

2.1.3 Slope correction

The values of run-off coefficient given in Table 1 shall be adjusted for slope in accordance with Table 2.

COMMENT:
The values in Table 1 assume an average sloping terrain of 5-10% (i.e. gently rolling). However, if the terrain is flatter or steeper this will have the effect of slowing down or speeding up overland flow. The above adjustment allows for this.

2.2 Rainfall intensity

2.2.1 The rainfall intensity shall be that for a storm having a duration equal to the time of concentration as determined by Paragraph 2.3.1, and a probability of occurrence as given by NZBC E1.3.1 or E1.3.2 as appropriate. Either local rainfall intensity curves produced by the *territorial authority* or rainfall frequency

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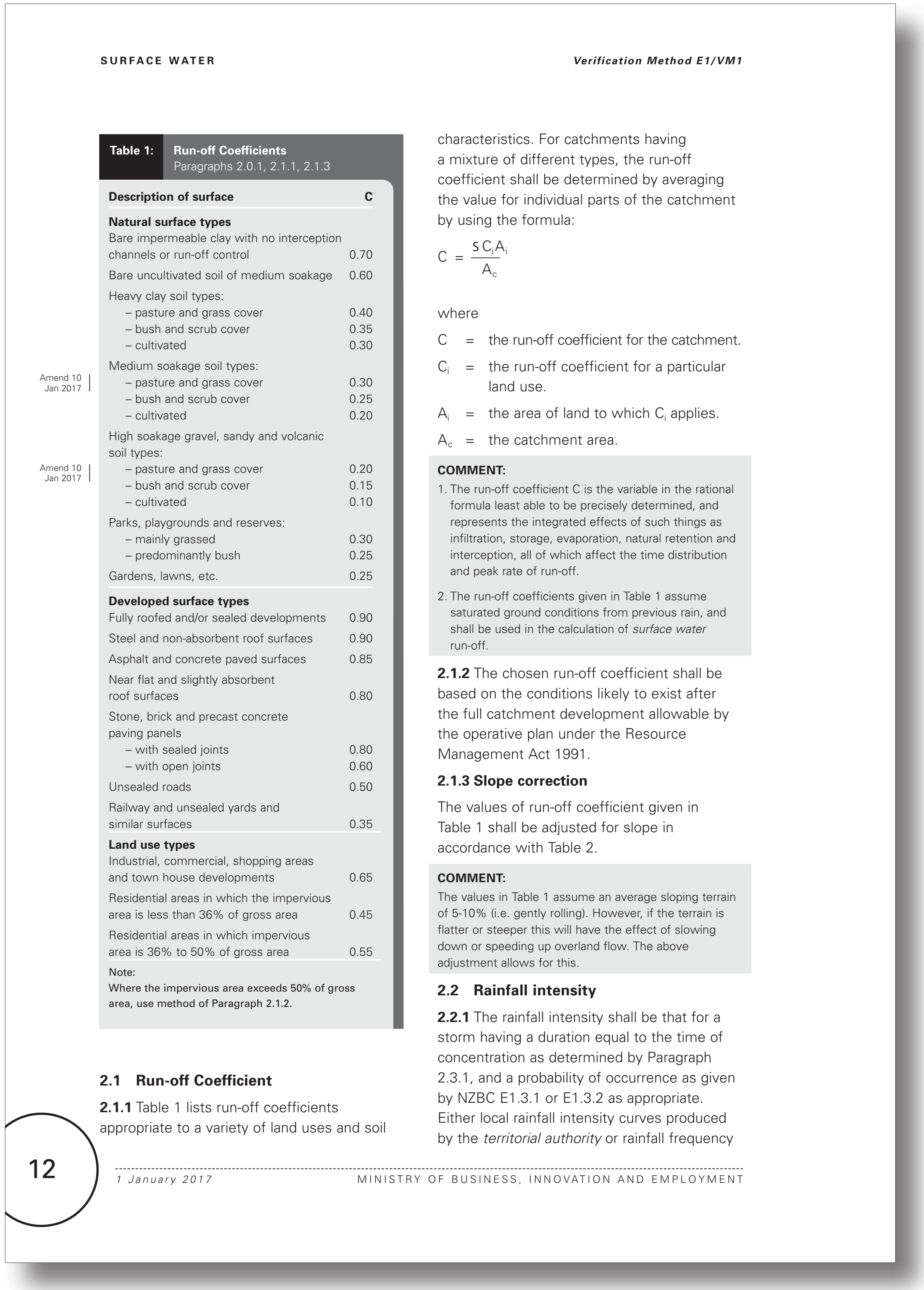

SURFACE WATER Verification Method E1/VM1

Table 1: Run-off Coefficients
Paragraphs 2.0.1, 2.1.1, 2.1.3

Amend 10 Jan 2017

Amend 10 Jan 2017

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Unsealed roads	0.50
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Industrial, commercial, shopping areas and town house developments	0.65
Residential areas in which the impervious area is less than 36% of gross area	0.45
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2.1.1 Table 1 lists run-off coefficients appropriate to a variety of land uses and soil characteristics. For catchments having a mixture of different types, the run-off coefficient shall be determined by averaging the value for individual parts of the catchment by using the formula:

$$C = \frac{s\, C_i A_i}{A_c}$$

where

C = the run-off coefficient for the catchment.

C_i = the run-off coefficient for a particular land use.

A_i = the area of land to which C_i applies.

A_c = the catchment area.

COMMENT:

1. The run-off coefficient C is the variable in the rational formula least able to be precisely determined, and represents the integrated effects of such things as infiltration, storage, evaporation, natural retention and interception, all of which affect the time distribution and peak rate of run-off.
2. The run-off coefficients given in Table 1 assume saturated ground conditions from previous rain, and shall be used in the calculation of *surface water* run-off.

2.1.2 The chosen run-off coefficient shall be based on the conditions likely to exist after the full catchment development allowable by the operative plan under the Resource Management Act 1991.

2.1.3 Slope correction

The values of run-off coefficient given in Table 1 shall be adjusted for slope in accordance with Table 2.

COMMENT:
The values in Table 1 assume an average sloping terrain of 5-10% (i.e. gently rolling). However, if the terrain is flatter or steeper this will have the effect of slowing down or speeding up overland flow. The above adjustment allows for this.

2.2 Rainfall intensity

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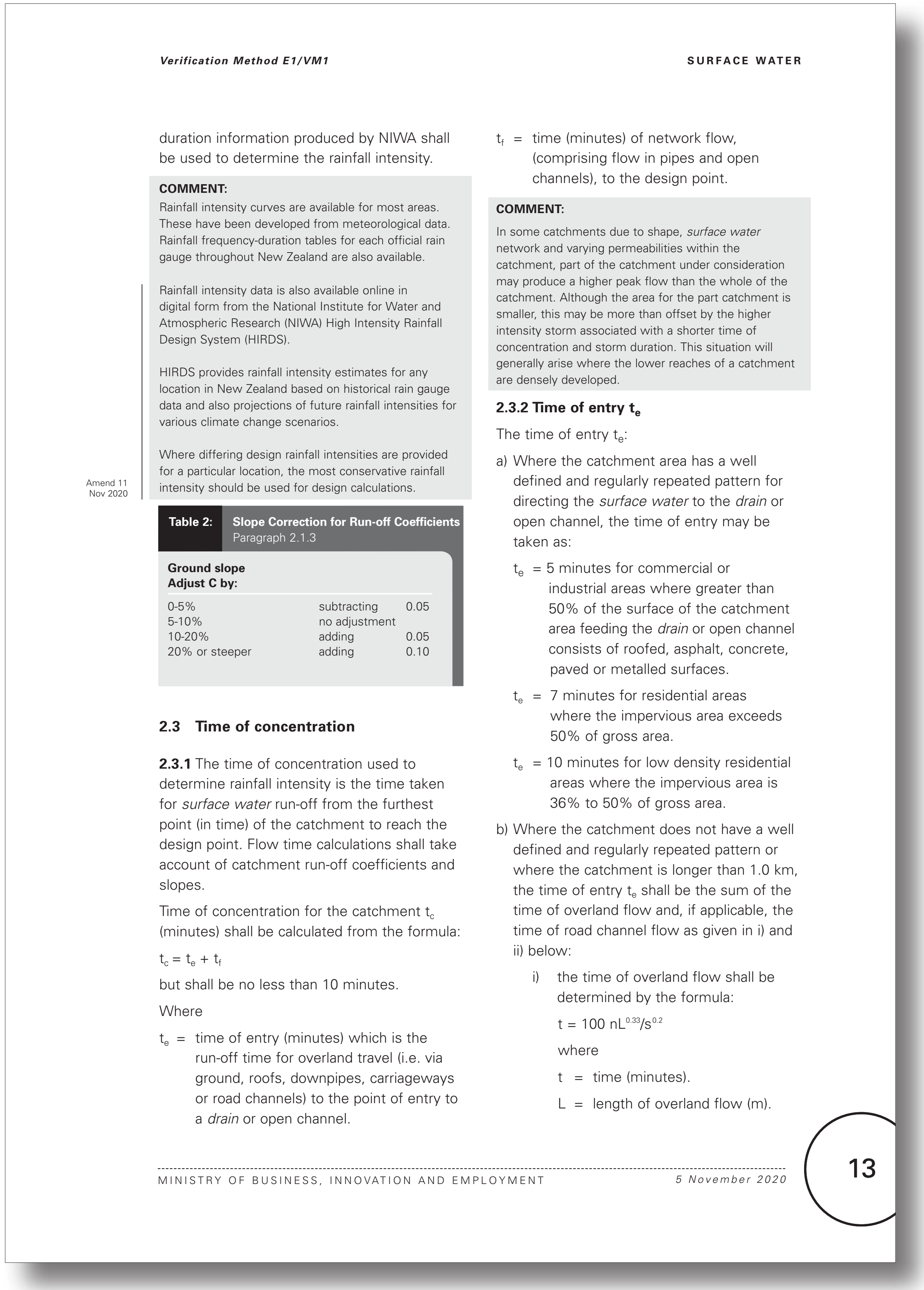

duration information produced by NIWA shall be used to determine the rainfall intensity.

COMMENT:
Rainfall intensity curves are available for most areas. These have been developed from meteorological data. Rainfall frequency-duration tables for each official rain gauge throughout New Zealand are also available.

Rainfall intensity data is also available online in digital form from the National Institute for Water and Atmospheric Research (NIWA) High Intensity Rainfall Design System (HIRDS).

HIRDS provides rainfall intensity estimates for any location in New Zealand based on historical rain gauge data and also projections of future rainfall intensities for various climate change scenarios.

Where differing design rainfall intensities are provided for a particular location, the most conservative rainfall intensity should be used for design calculations.

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Nov 2020

Table 2: Slope Correction for Run-off Coefficients
Paragraph 2.1.3

Ground slope Adjust C by:		
0-5%	subtracting	0.05
5-10%	no adjustment	
10-20%	adding	0.05
20% or steeper	adding	0.10

2.3 Time of concentration

2.3.1 The time of concentration used to determine rainfall intensity is the time taken for *surface water* run-off from the furthest point (in time) of the catchment to reach the design point. Flow time calculations shall take account of catchment run-off coefficients and slopes.

Time of concentration for the catchment t_c (minutes) shall be calculated from the formula:

$t_c = t_e + t_f$

but shall be no less than 10 minutes.

Where

t_e = time of entry (minutes) which is the run-off time for overland travel (i.e. via ground, roofs, downpipes, carriageways or road channels) to the point of entry to a *drain* or open channel.

t_f = time (minutes) of network flow, (comprising flow in pipes and open channels), to the design point.

COMMENT:
In some catchments due to shape, *surface water* network and varying permeabilities within the catchment, part of the catchment under consideration may produce a higher peak flow than the whole of the catchment. Although the area for the part catchment is smaller, this may be more than offset by the higher intensity storm associated with a shorter time of concentration and storm duration. This situation will generally arise where the lower reaches of a catchment are densely developed.

2.3.2 Time of entry t_e

The time of entry t_e:

a) Where the catchment area has a well defined and regularly repeated pattern for directing the *surface water* to the *drain* or open channel, the time of entry may be taken as:

t_e = 5 minutes for commercial or industrial areas where greater than 50% of the surface of the catchment area feeding the *drain* or open channel consists of roofed, asphalt, concrete, paved or metalled surfaces.

t_e = 7 minutes for residential areas where the impervious area exceeds 50% of gross area.

t_e = 10 minutes for low density residential areas where the impervious area is 36% to 50% of gross area.

b) Where the catchment does not have a well defined and regularly repeated pattern or where the catchment is longer than 1.0 km, the time of entry t_e shall be the sum of the time of overland flow and, if applicable, the time of road channel flow as given in i) and ii) below:

i) the time of overland flow shall be determined by the formula:

$t = 100\ nL^{0.33}/s^{0.2}$

where

t = time (minutes).

L = length of overland flow (m).

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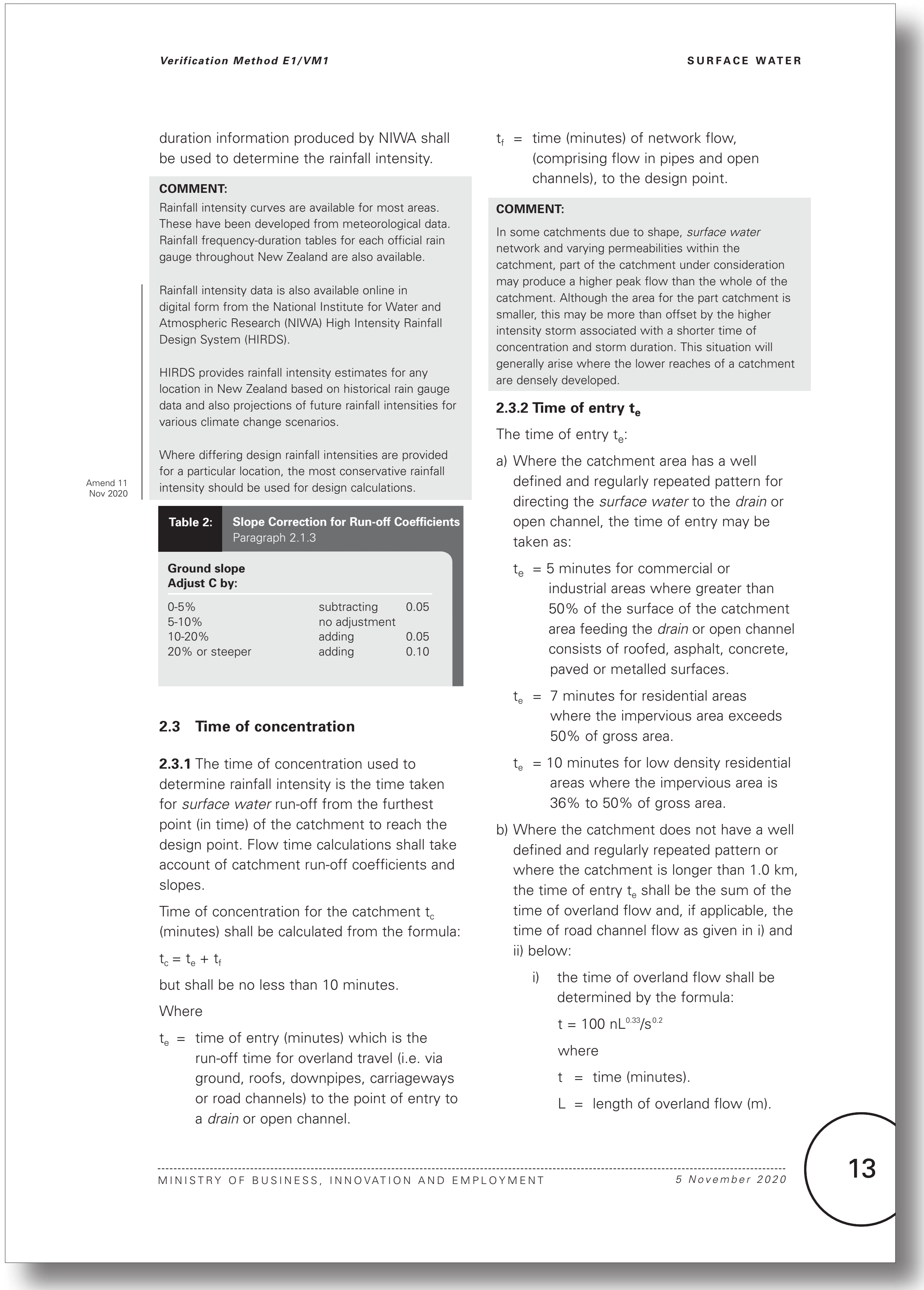

Verification Method E1/VM1 SURFACE WATER

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Amend 11
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where

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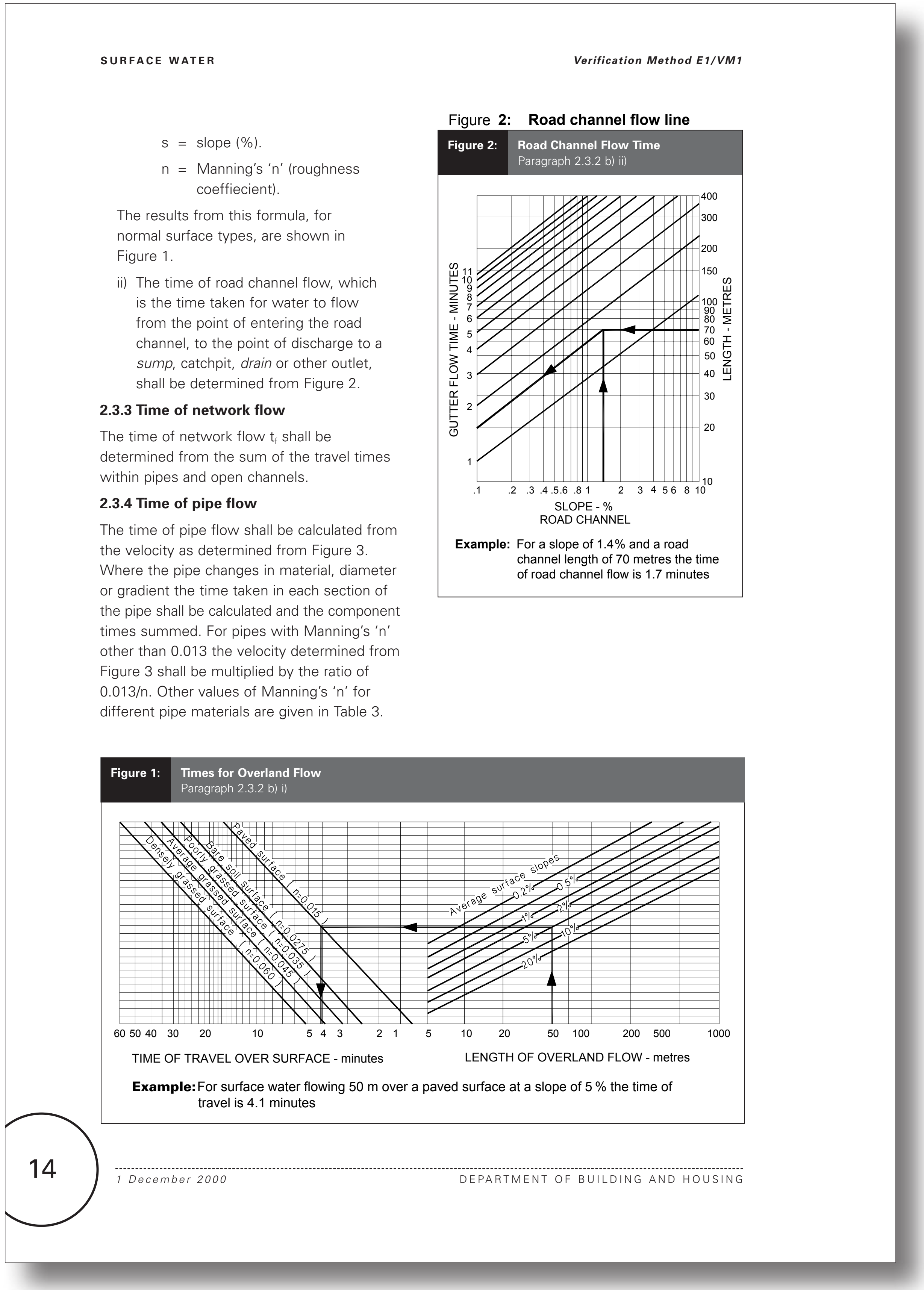

SURFACE WATER Verification Method E1/VM1

s = slope (%).

n = Manning's 'n' (roughness coeffiecient).

The results from this formula, for normal surface types, are shown in Figure 1.

ii) The time of road channel flow, which is the time taken for water to flow from the point of entering the road channel, to the point of discharge to a *sump*, catchpit, *drain* or other outlet, shall be determined from Figure 2.

2.3.3 Time of network flow

The time of network flow t_f shall be determined from the sum of the travel times within pipes and open channels.

2.3.4 Time of pipe flow

The time of pipe flow shall be calculated from the velocity as determined from Figure 3. Where the pipe changes in material, diameter or gradient the time taken in each section of the pipe shall be calculated and the component times summed. For pipes with Manning's 'n' other than 0.013 the velocity determined from Figure 3 shall be multiplied by the ratio of 0.013/n. Other values of Manning's 'n' for different pipe materials are given in Table 3.

Figure **2:** **Road channel flow line**

Figure 2: **Road Channel Flow Time**
Paragraph 2.3.2 b) ii)

Example: For a slope of 1.4% and a road channel length of 70 metres the time of road channel flow is 1.7 minutes

Figure 1: **Times for Overland Flow**
Paragraph 2.3.2 b) i)

Example: For surface water flowing 50 m over a paved surface at a slope of 5 % the time of travel is 4.1 minutes

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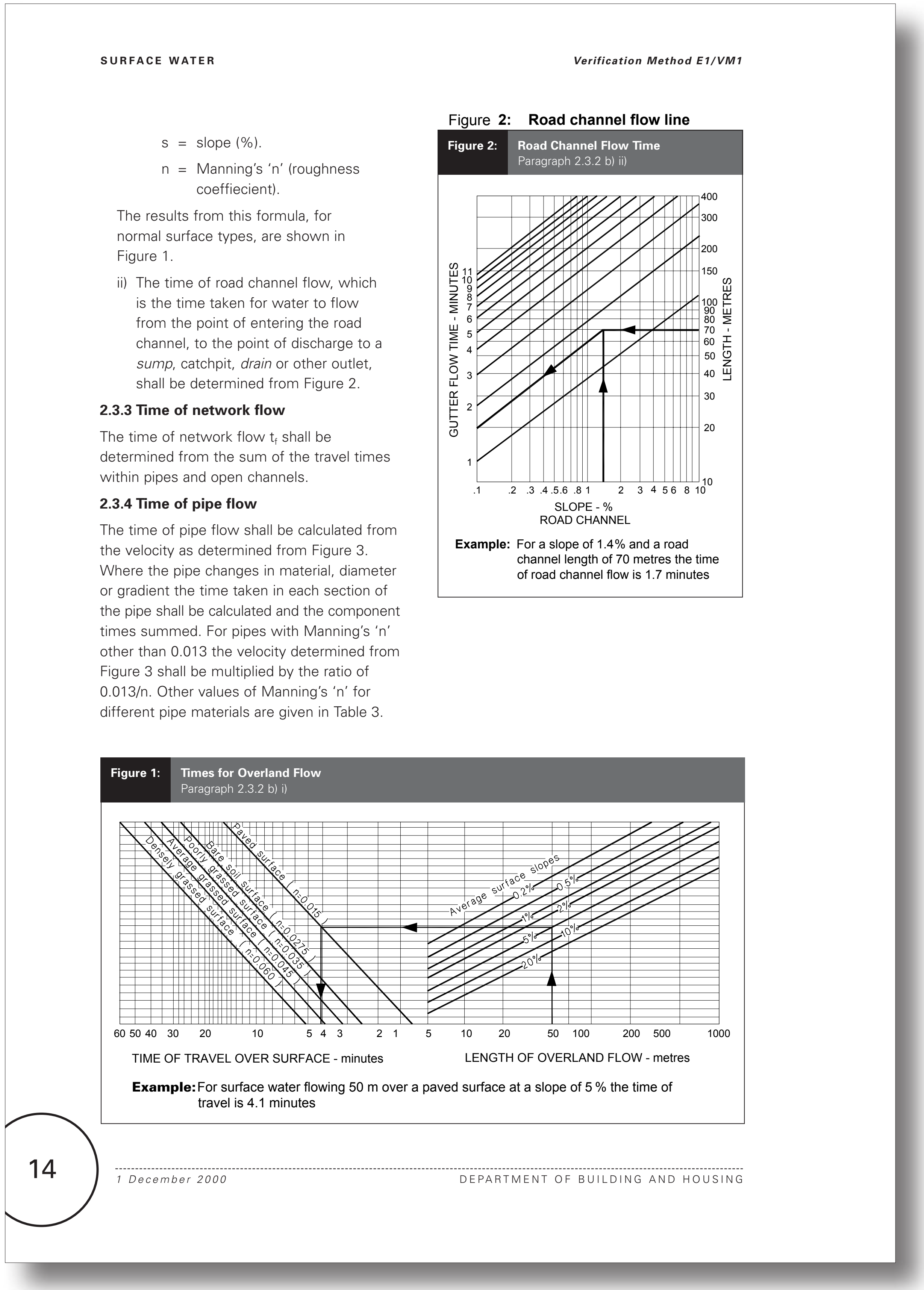

SURFACE WATER Verification Method E1/VM1

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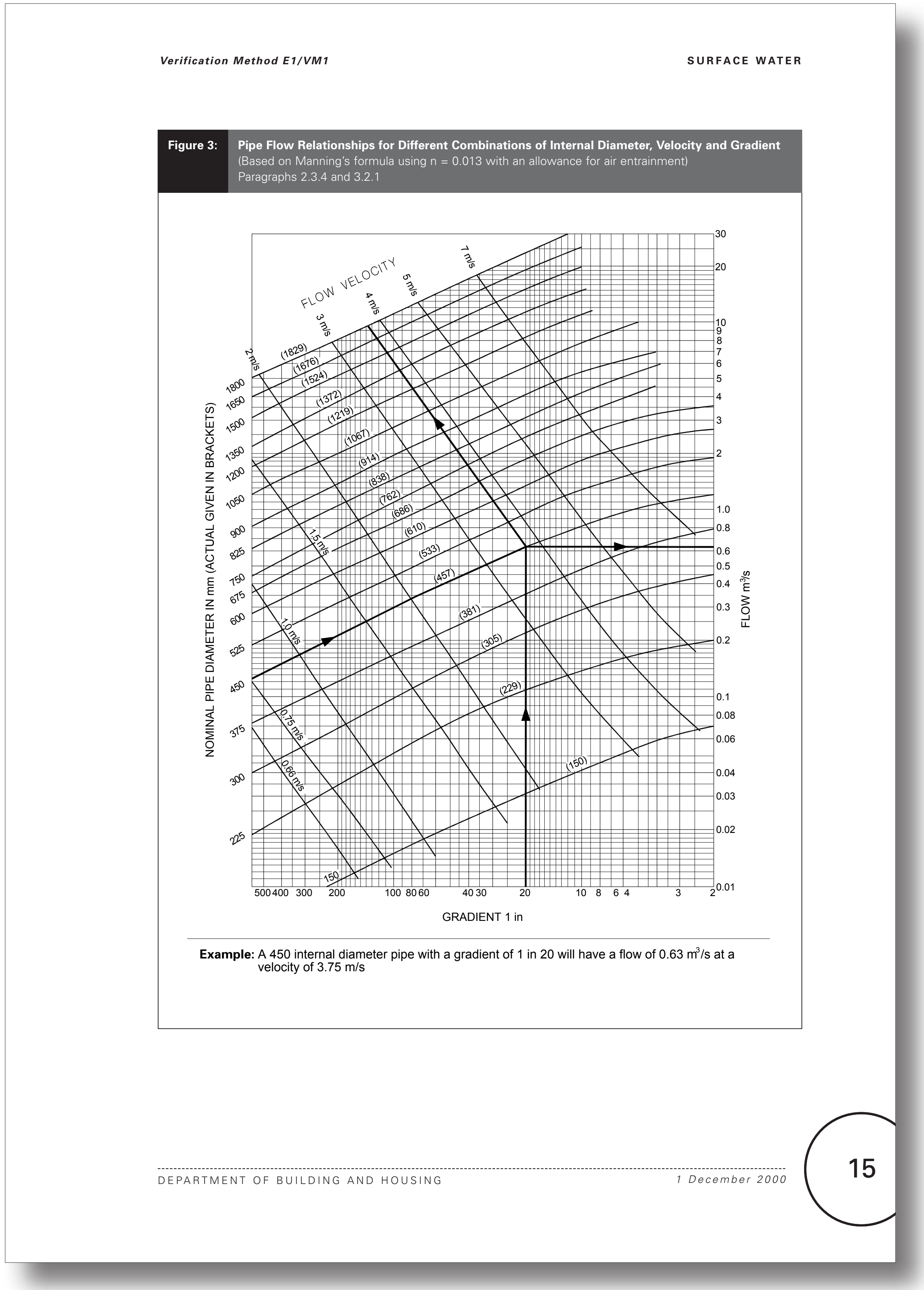

Verification Method E1/VM1 SURFACE WATER

Figure 3: **Pipe Flow Relationships for Different Combinations of Internal Diameter, Velocity and Gradient**
(Based on Manning's formula using n = 0.013 with an allowance for air entrainment)
Paragraphs 2.3.4 and 3.2.1

Example: A 450 internal diameter pipe with a gradient of 1 in 20 will have a flow of 0.63 m³/s at a velocity of 3.75 m/s

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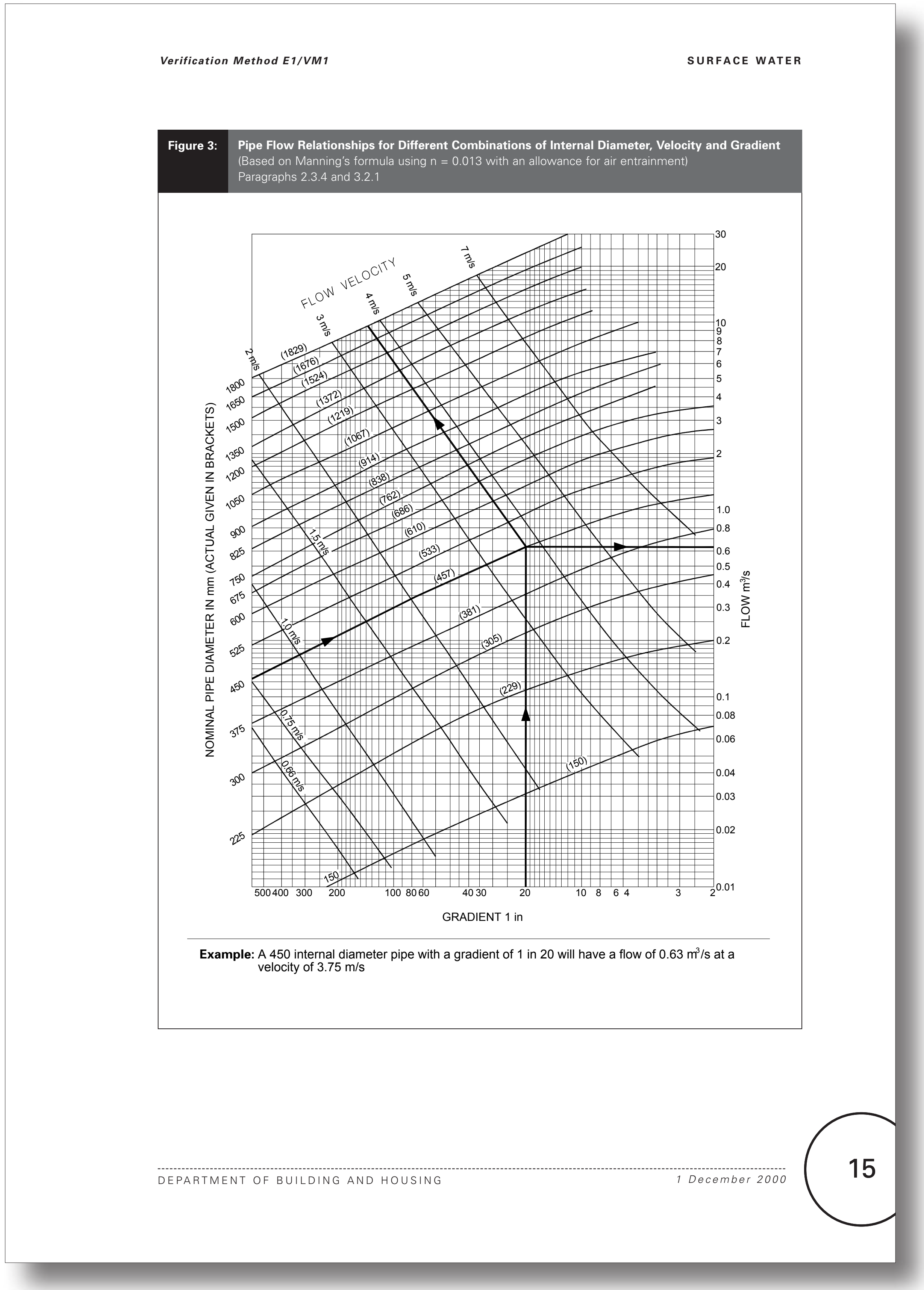
Proposed E1 Surface Water - No changes proposed to this page



Verification Method E1/VM1 SURFACE WATER

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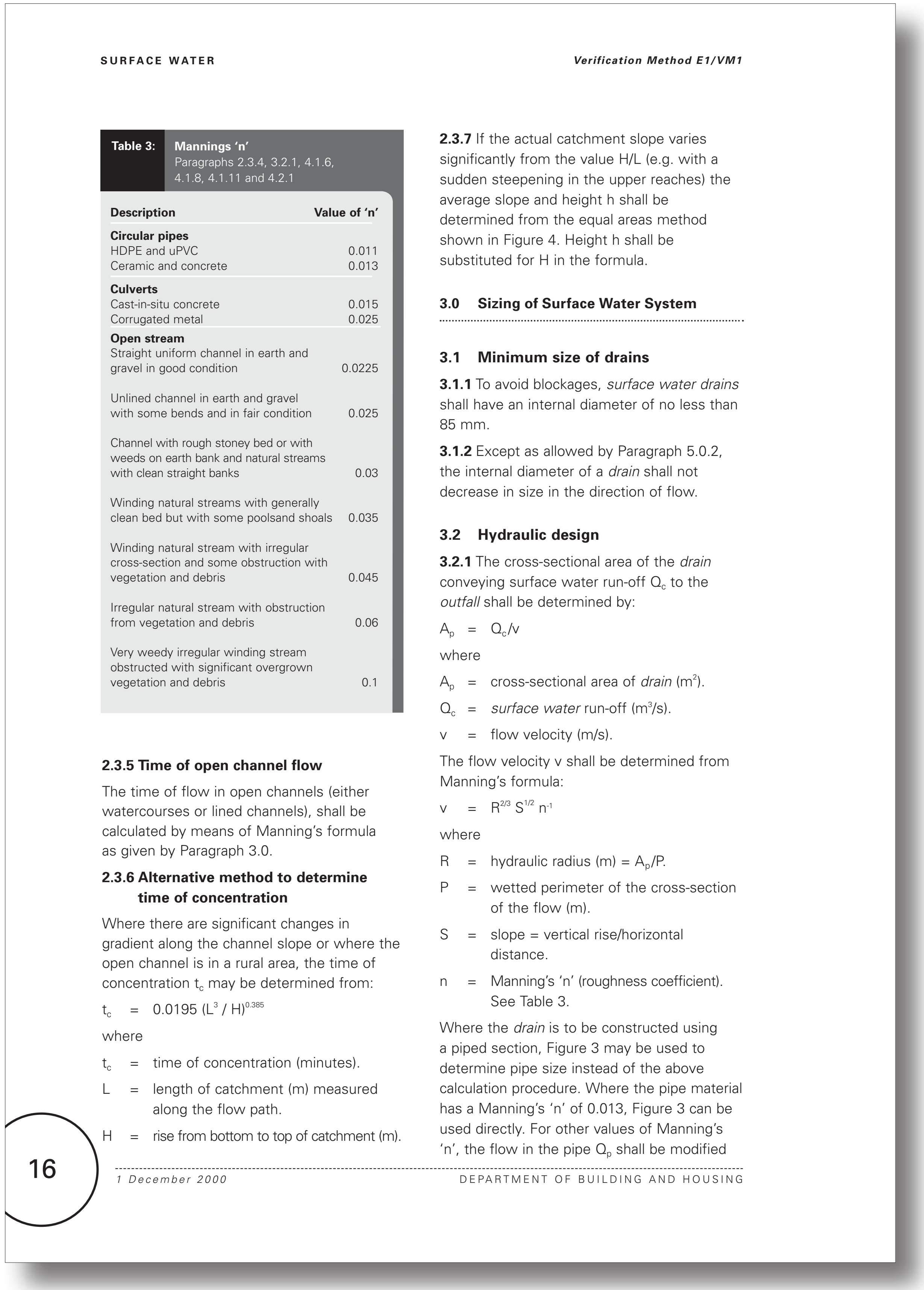

Table 3: Mannings 'n'
Paragraphs 2.3.4, 3.2.1, 4.1.6, 4.1.8, 4.1.11 and 4.2.1

Description	Value of 'n'
Circular pipes	
HDPE and uPVC	0.011
Ceramic and concrete	0.013
Culverts	
Cast-in-situ concrete	0.015
Corrugated metal	0.025
Open stream	
Straight uniform channel in earth and gravel in good condition	0.0225
Unlined channel in earth and gravel with some bends and in fair condition	0.025
Channel with rough stoney bed or with weeds on earth bank and natural streams with clean straight banks	0.03
Winding natural streams with generally clean bed but with some poolsand shoals	0.035
Winding natural stream with irregular cross-section and some obstruction with vegetation and debris	0.045
Irregular natural stream with obstruction from vegetation and debris	0.06
Very weedy irregular winding stream obstructed with significant overgrown vegetation and debris	0.1

2.3.5 Time of open channel flow

The time of flow in open channels (either watercourses or lined channels), shall be calculated by means of Manning's formula as given by Paragraph 3.0.

2.3.6 Alternative method to determine time of concentration

Where there are significant changes in gradient along the channel slope or where the open channel is in a rural area, the time of concentration t_c may be determined from:

t_c = $0.0195 (L^3 / H)^{0.385}$

where

t_c = time of concentration (minutes).

L = length of catchment (m) measured along the flow path.

H = rise from bottom to top of catchment (m).

2.3.7 If the actual catchment slope varies significantly from the value H/L (e.g. with a sudden steepening in the upper reaches) the average slope and height h shall be determined from the equal areas method shown in Figure 4. Height h shall be substituted for H in the formula.

3.0 Sizing of Surface Water System

3.1 Minimum size of drains

3.1.1 To avoid blockages, *surface water drains* shall have an internal diameter of no less than 85 mm.

3.1.2 Except as allowed by Paragraph 5.0.2, the internal diameter of a *drain* shall not decrease in size in the direction of flow.

3.2 Hydraulic design

3.2.1 The cross-sectional area of the *drain* conveying surface water run-off Q_c to the *outfall* shall be determined by:

$A_p = Q_c/v$

where

A_p = cross-sectional area of *drain* (m^2).

Q_c = *surface water* run-off (m^3/s).

v = flow velocity (m/s).

The flow velocity v shall be determined from Manning's formula:

$v = R^{2/3} S^{1/2} n^{-1}$

where

R = hydraulic radius (m) = A_p/P.

P = wetted perimeter of the cross-section of the flow (m).

S = slope = vertical rise/horizontal distance.

n = Manning's 'n' (roughness coefficient). See Table 3.

Where the *drain* is to be constructed using a piped section, Figure 3 may be used to determine pipe size instead of the above calculation procedure. Where the pipe material has a Manning's 'n' of 0.013, Figure 3 can be used directly. For other values of Manning's 'n', the flow in the pipe Q_p shall be modified

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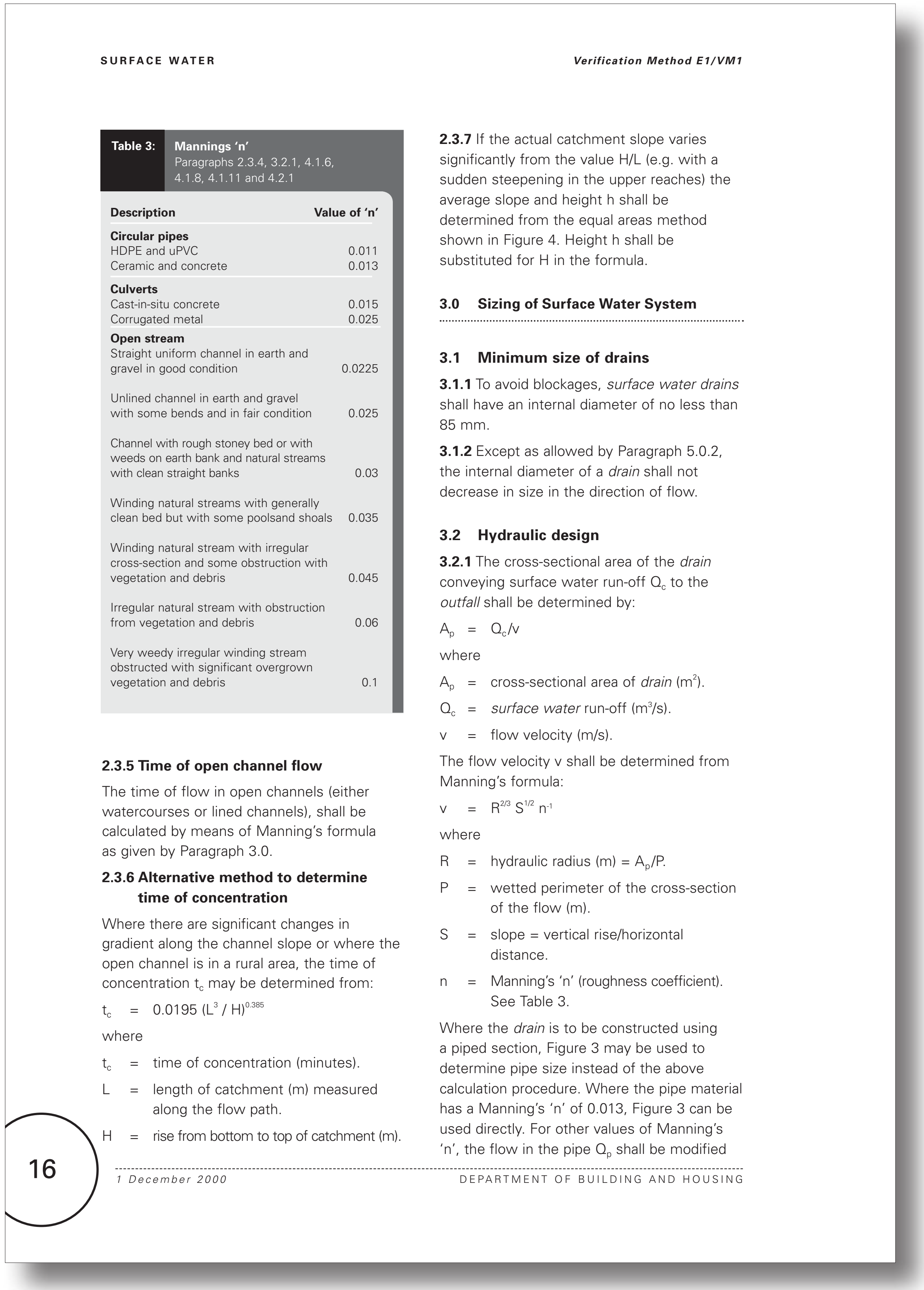

SURFACE WATER

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Paragraphs 2.3.4, 3.2.1, 4.1.6, 4.1.8, 4.1.11 and 4.2.1

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Open stream	
Straight uniform channel in earth and gravel in good condition	0.0225
Unlined channel in earth and gravel with some bends and in fair condition	0.025
Channel with rough stoney bed or with weeds on earth bank and natural streams with clean straight banks	0.03
Winding natural streams with generally clean bed but with some poolsand shoals	0.035
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The time of flow in open channels (either watercourses or lined channels), shall be calculated by means of Manning's formula as given by Paragraph 3.0.

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L = length of catchment (m) measured along the flow path.

H = rise from bottom to top of catchment (m).

2.3.7 If the actual catchment slope varies significantly from the value H/L (e.g. with a sudden steepening in the upper reaches) the average slope and height h shall be determined from the equal areas method shown in Figure 4. Height h shall be substituted for H in the formula.

3.0 Sizing of Surface Water System

3.1 Minimum size of drains

3.1.1 To avoid blockages, *surface water drains* shall have an internal diameter of no less than 85 mm.

3.1.2 Except as allowed by Paragraph 5.0.2, the internal diameter of a *drain* shall not decrease in size in the direction of flow.

3.2 Hydraulic design

3.2.1 The cross-sectional area of the *drain* conveying surface water run-off Q_c to the *outfall* shall be determined by:

$A_p = Q_c/v$

where

A_p = cross-sectional area of *drain* (m^2).

Q_c = *surface water* run-off (m^3/s).

v = flow velocity (m/s).

The flow velocity v shall be determined from Manning's formula:

$v = R^{2/3} S^{1/2} n^{-1}$

where

R = hydraulic radius (m) = A_p/P.

P = wetted perimeter of the cross-section of the flow (m).

S = slope = vertical rise/horizontal distance.

n = Manning's 'n' (roughness coefficient). See Table 3.

Where the *drain* is to be constructed using a piped section, Figure 3 may be used to determine pipe size instead of the above calculation procedure. Where the pipe material has a Manning's 'n' of 0.013, Figure 3 can be used directly. For other values of Manning's 'n', the flow in the pipe Q_p shall be modified

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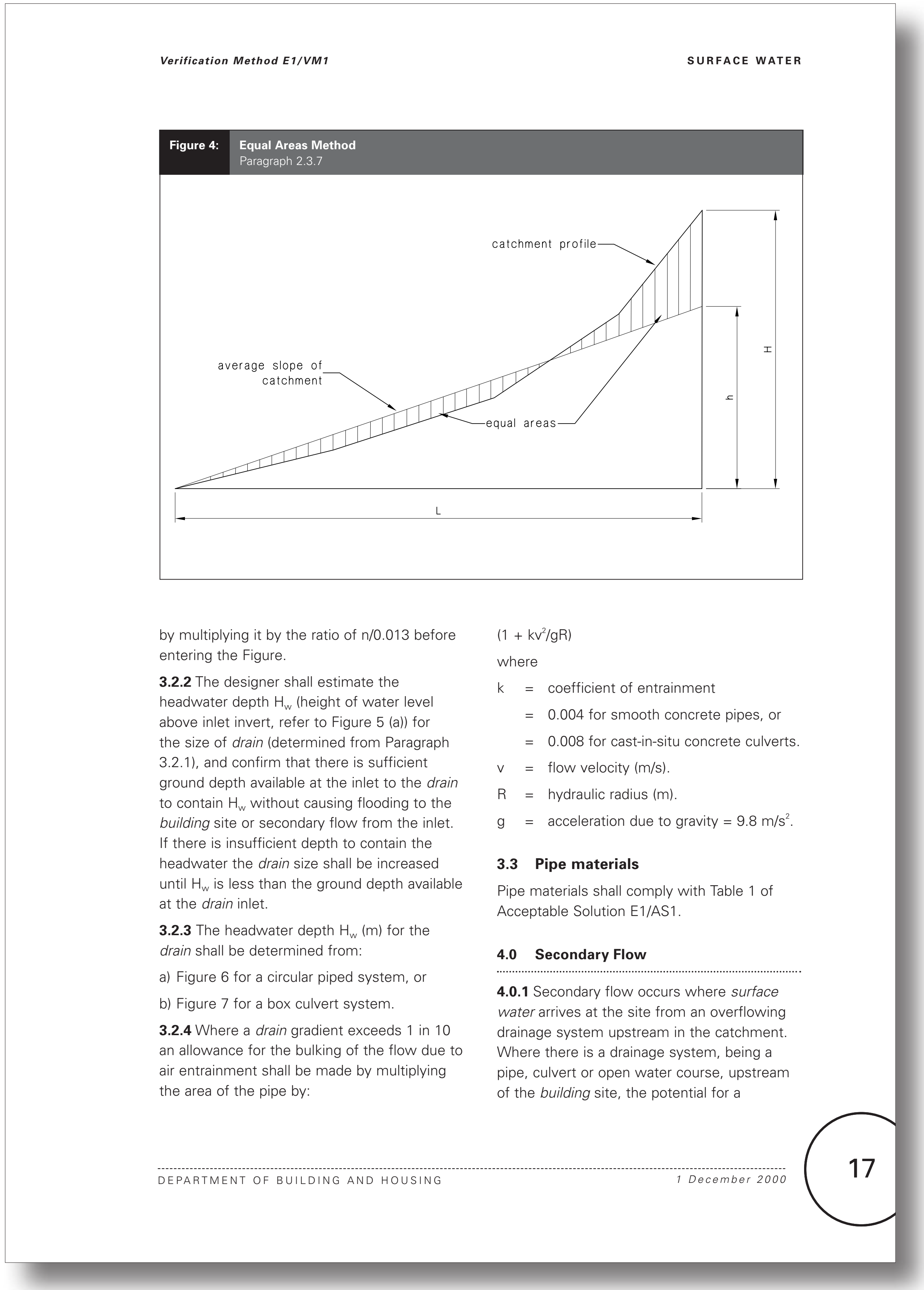

Figure 4: **Equal Areas Method**
Paragraph 2.3.7

by multiplying it by the ratio of n/0.013 before entering the Figure.

3.2.2 The designer shall estimate the headwater depth H_w (height of water level above inlet invert, refer to Figure 5 (a)) for the size of *drain* (determined from Paragraph 3.2.1), and confirm that there is sufficient ground depth available at the inlet to the *drain* to contain H_w without causing flooding to the *building* site or secondary flow from the inlet. If there is insufficient depth to contain the headwater the *drain* size shall be increased until H_w is less than the ground depth available at the *drain* inlet.

3.2.3 The headwater depth H_w (m) for the *drain* shall be determined from:

a) Figure 6 for a circular piped system, or

b) Figure 7 for a box culvert system.

3.2.4 Where a *drain* gradient exceeds 1 in 10 an allowance for the bulking of the flow due to air entrainment shall be made by multiplying the area of the pipe by:

$(1 + kv^2/gR)$

where

k = coefficient of entrainment
= 0.004 for smooth concrete pipes, or
= 0.008 for cast-in-situ concrete culverts.
v = flow velocity (m/s).
R = hydraulic radius (m).
g = acceleration due to gravity = 9.8 m/s^2.

3.3 Pipe materials

Pipe materials shall comply with Table 1 of Acceptable Solution E1/AS1.

4.0 Secondary Flow

4.0.1 Secondary flow occurs where *surface water* arrives at the site from an overflowing drainage system upstream in the catchment. Where there is a drainage system, being a pipe, culvert or open water course, upstream of the *building* site, the potential for a

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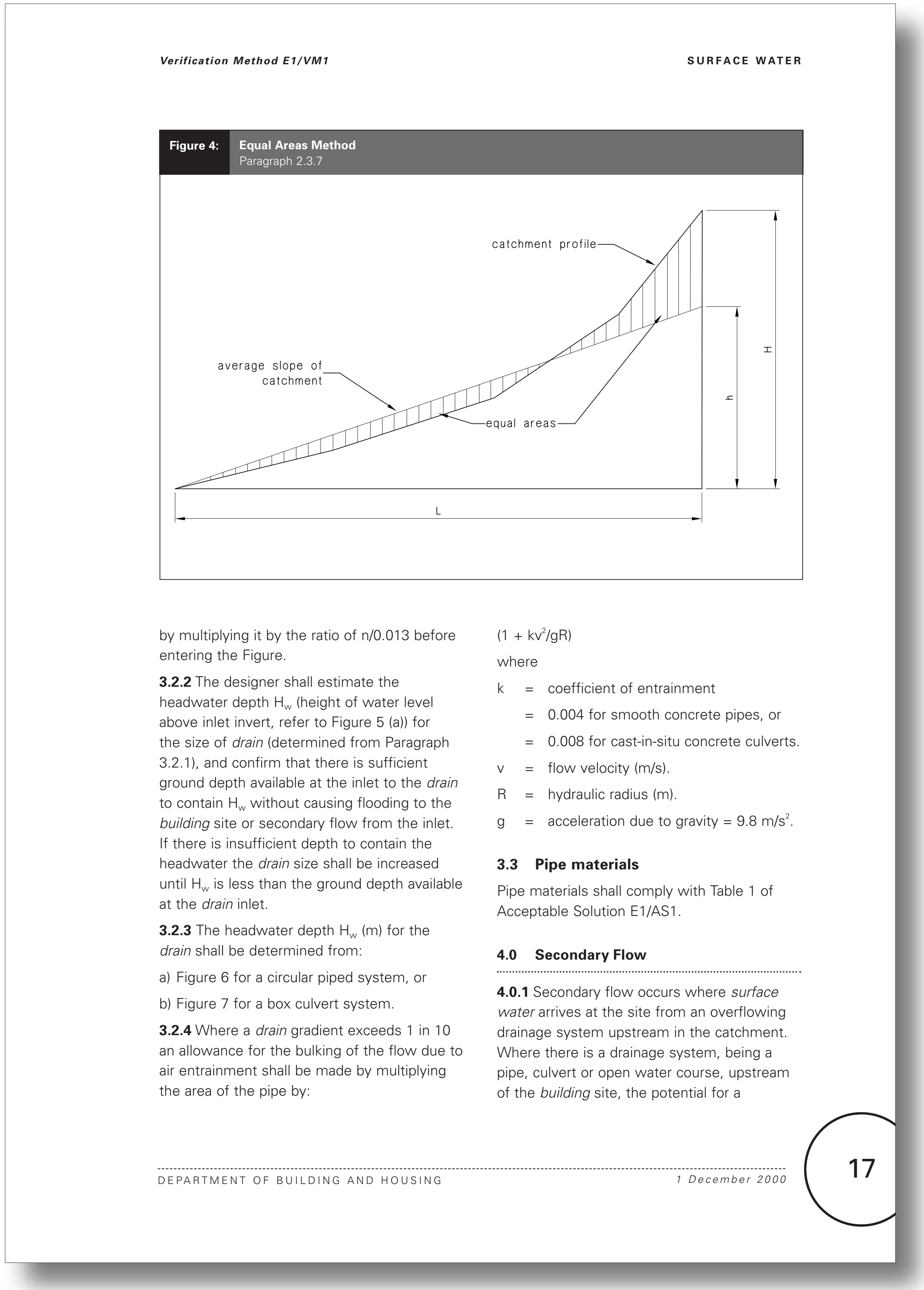

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Figure 4: **Equal Areas Method**
Paragraph 2.3.7

catchment profile
average slope of catchment
equal areas
H
h
L

by multiplying it by the ratio of n/0.013 before entering the Figure.

3.2.2 The designer shall estimate the headwater depth H_w (height of water level above inlet invert, refer to Figure 5 (a)) for the size of *drain* (determined from Paragraph 3.2.1), and confirm that there is sufficient ground depth available at the inlet to the *drain* to contain H_w without causing flooding to the *building* site or secondary flow from the inlet. If there is insufficient depth to contain the headwater the *drain* size shall be increased until H_w is less than the ground depth available at the *drain* inlet.

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= 0.004 for smooth concrete pipes, or
= 0.008 for cast-in-situ concrete culverts.
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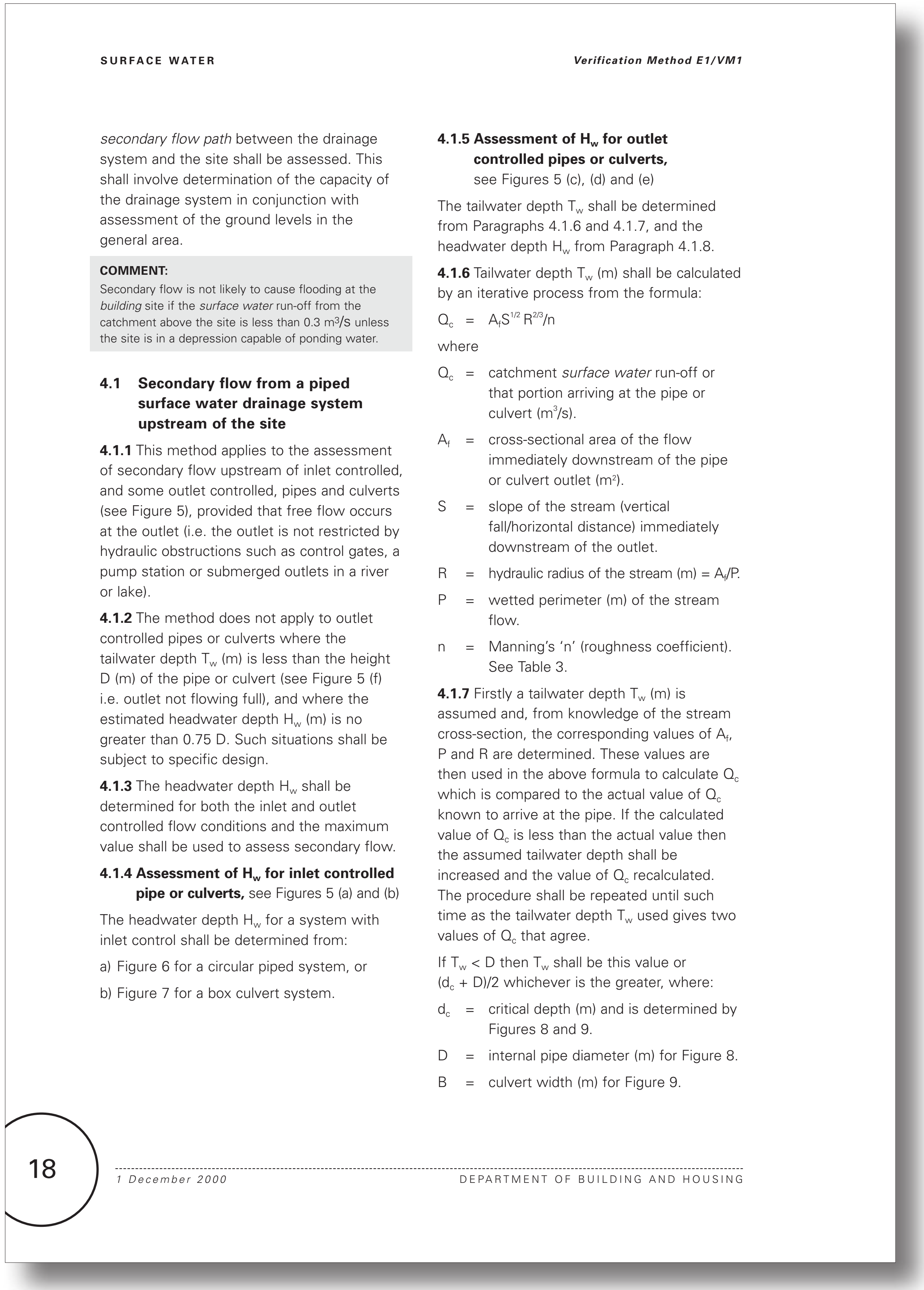

secondary flow path between the drainage system and the site shall be assessed. This shall involve determination of the capacity of the drainage system in conjunction with assessment of the ground levels in the general area.

COMMENT:
Secondary flow is not likely to cause flooding at the *building* site if the *surface water* run-off from the catchment above the site is less than 0.3 m³/S unless the site is in a depression capable of ponding water.

4.1 Secondary flow from a piped surface water drainage system upstream of the site

4.1.1 This method applies to the assessment of secondary flow upstream of inlet controlled, and some outlet controlled, pipes and culverts (see Figure 5), provided that free flow occurs at the outlet (i.e. the outlet is not restricted by hydraulic obstructions such as control gates, a pump station or submerged outlets in a river or lake).

4.1.2 The method does not apply to outlet controlled pipes or culverts where the tailwater depth T_w (m) is less than the height D (m) of the pipe or culvert (see Figure 5 (f) i.e. outlet not flowing full), and where the estimated headwater depth H_w (m) is no greater than 0.75 D. Such situations shall be subject to specific design.

4.1.3 The headwater depth H_w shall be determined for both the inlet and outlet controlled flow conditions and the maximum value shall be used to assess secondary flow.

4.1.4 Assessment of H_w for inlet controlled pipe or culverts, see Figures 5 (a) and (b)

The headwater depth H_w for a system with inlet control shall be determined from:

a) Figure 6 for a circular piped system, or

b) Figure 7 for a box culvert system.

4.1.5 Assessment of H_w for outlet controlled pipes or culverts, see Figures 5 (c), (d) and (e)

The tailwater depth T_w shall be determined from Paragraphs 4.1.6 and 4.1.7, and the headwater depth H_w from Paragraph 4.1.8.

4.1.6 Tailwater depth T_w (m) shall be calculated by an iterative process from the formula:

$Q_c = A_f S^{1/2} R^{2/3}/n$

where

Q_c = catchment *surface water* run-off or that portion arriving at the pipe or culvert (m³/s).

A_f = cross-sectional area of the flow immediately downstream of the pipe or culvert outlet (m²).

S = slope of the stream (vertical fall/horizontal distance) immediately downstream of the outlet.

R = hydraulic radius of the stream (m) = A_f/P.

P = wetted perimeter (m) of the stream flow.

n = Manning's 'n' (roughness coefficient). See Table 3.

4.1.7 Firstly a tailwater depth T_w (m) is assumed and, from knowledge of the stream cross-section, the corresponding values of A_f, P and R are determined. These values are then used in the above formula to calculate Q_c which is compared to the actual value of Q_c known to arrive at the pipe. If the calculated value of Q_c is less than the actual value then the assumed tailwater depth shall be increased and the value of Q_c recalculated. The procedure shall be repeated until such time as the tailwater depth T_w used gives two values of Q_c that agree.

If $T_w < D$ then T_w shall be this value or $(d_c + D)/2$ whichever is the greater, where:

d_c = critical depth (m) and is determined by Figures 8 and 9.

D = internal pipe diameter (m) for Figure 8.

B = culvert width (m) for Figure 9.

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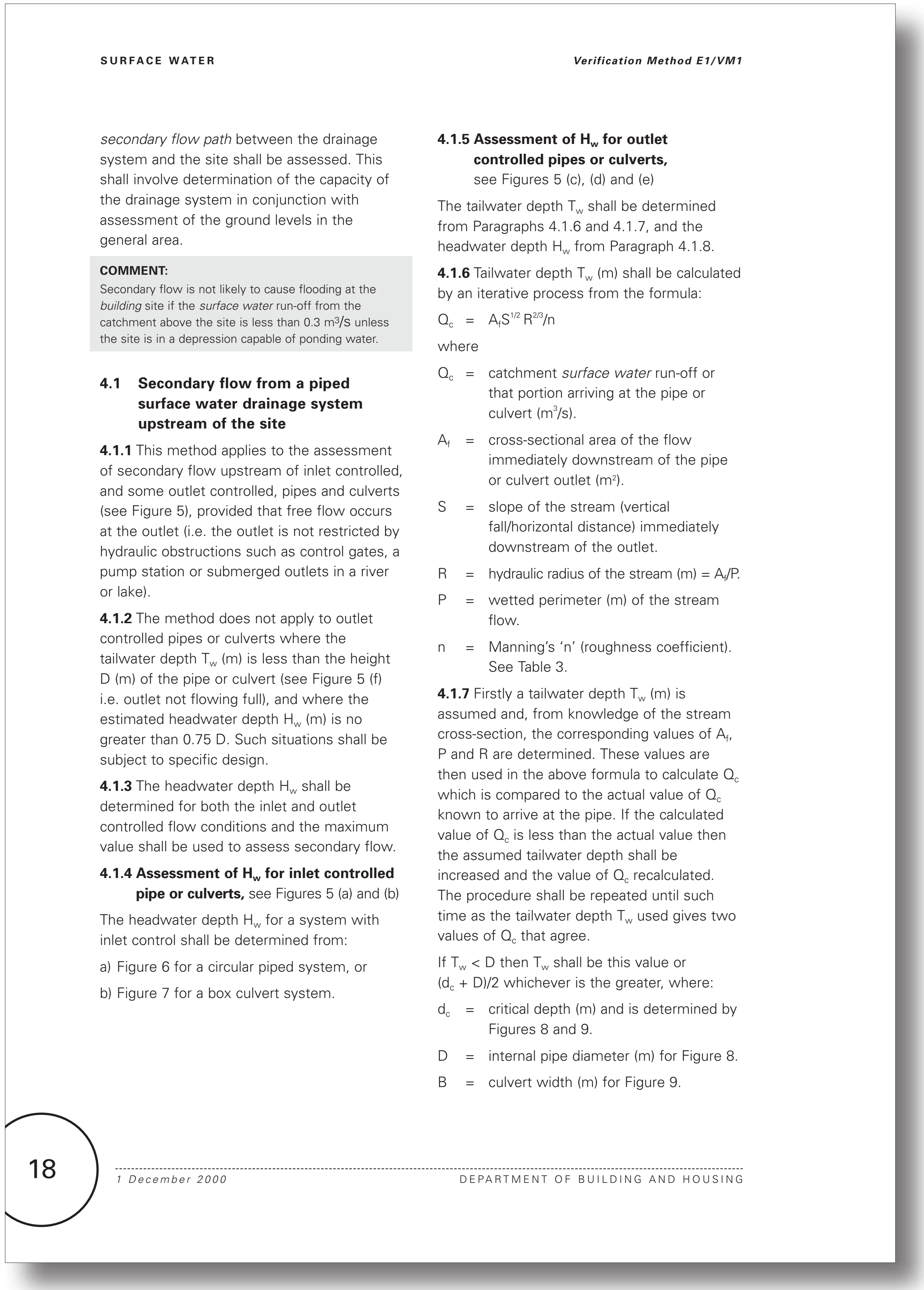

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secondary flow path between the drainage system and the site shall be assessed. This shall involve determination of the capacity of the drainage system in conjunction with assessment of the ground levels in the general area.

COMMENT:
Secondary flow is not likely to cause flooding at the *building* site if the *surface water* run-off from the catchment above the site is less than 0.3 m³/S unless the site is in a depression capable of ponding water.

4.1 Secondary flow from a piped surface water drainage system upstream of the site

4.1.1 This method applies to the assessment of secondary flow upstream of inlet controlled, and some outlet controlled, pipes and culverts (see Figure 5), provided that free flow occurs at the outlet (i.e. the outlet is not restricted by hydraulic obstructions such as control gates, a pump station or submerged outlets in a river or lake).

4.1.2 The method does not apply to outlet controlled pipes or culverts where the tailwater depth T_w (m) is less than the height D (m) of the pipe or culvert (see Figure 5 (f) i.e. outlet not flowing full), and where the estimated headwater depth H_w (m) is no greater than 0.75 D. Such situations shall be subject to specific design.

4.1.3 The headwater depth H_w shall be determined for both the inlet and outlet controlled flow conditions and the maximum value shall be used to assess secondary flow.

4.1.4 Assessment of H_w for inlet controlled pipe or culverts, see Figures 5 (a) and (b)

The headwater depth H_w for a system with inlet control shall be determined from:

a) Figure 6 for a circular piped system, or

b) Figure 7 for a box culvert system.

4.1.5 Assessment of H_w for outlet controlled pipes or culverts, see Figures 5 (c), (d) and (e)

The tailwater depth T_w shall be determined from Paragraphs 4.1.6 and 4.1.7, and the headwater depth H_w from Paragraph 4.1.8.

4.1.6 Tailwater depth T_w (m) shall be calculated by an iterative process from the formula:

$Q_c = A_f S^{1/2} R^{2/3}/n$

where

Q_c = catchment *surface water* run-off or that portion arriving at the pipe or culvert (m³/s).

A_f = cross-sectional area of the flow immediately downstream of the pipe or culvert outlet (m²).

S = slope of the stream (vertical fall/horizontal distance) immediately downstream of the outlet.

R = hydraulic radius of the stream (m) = A_f/P.

P = wetted perimeter (m) of the stream flow.

n = Manning's 'n' (roughness coefficient). See Table 3.

4.1.7 Firstly a tailwater depth T_w (m) is assumed and, from knowledge of the stream cross-section, the corresponding values of A_f, P and R are determined. These values are then used in the above formula to calculate Q_c which is compared to the actual value of Q_c known to arrive at the pipe. If the calculated value of Q_c is less than the actual value then the assumed tailwater depth shall be increased and the value of Q_c recalculated. The procedure shall be repeated until such time as the tailwater depth T_w used gives two values of Q_c that agree.

If $T_w < D$ then T_w shall be this value or $(d_c + D)/2$ whichever is the greater, where:

d_c = critical depth (m) and is determined by Figures 8 and 9.

D = internal pipe diameter (m) for Figure 8.

B = culvert width (m) for Figure 9.

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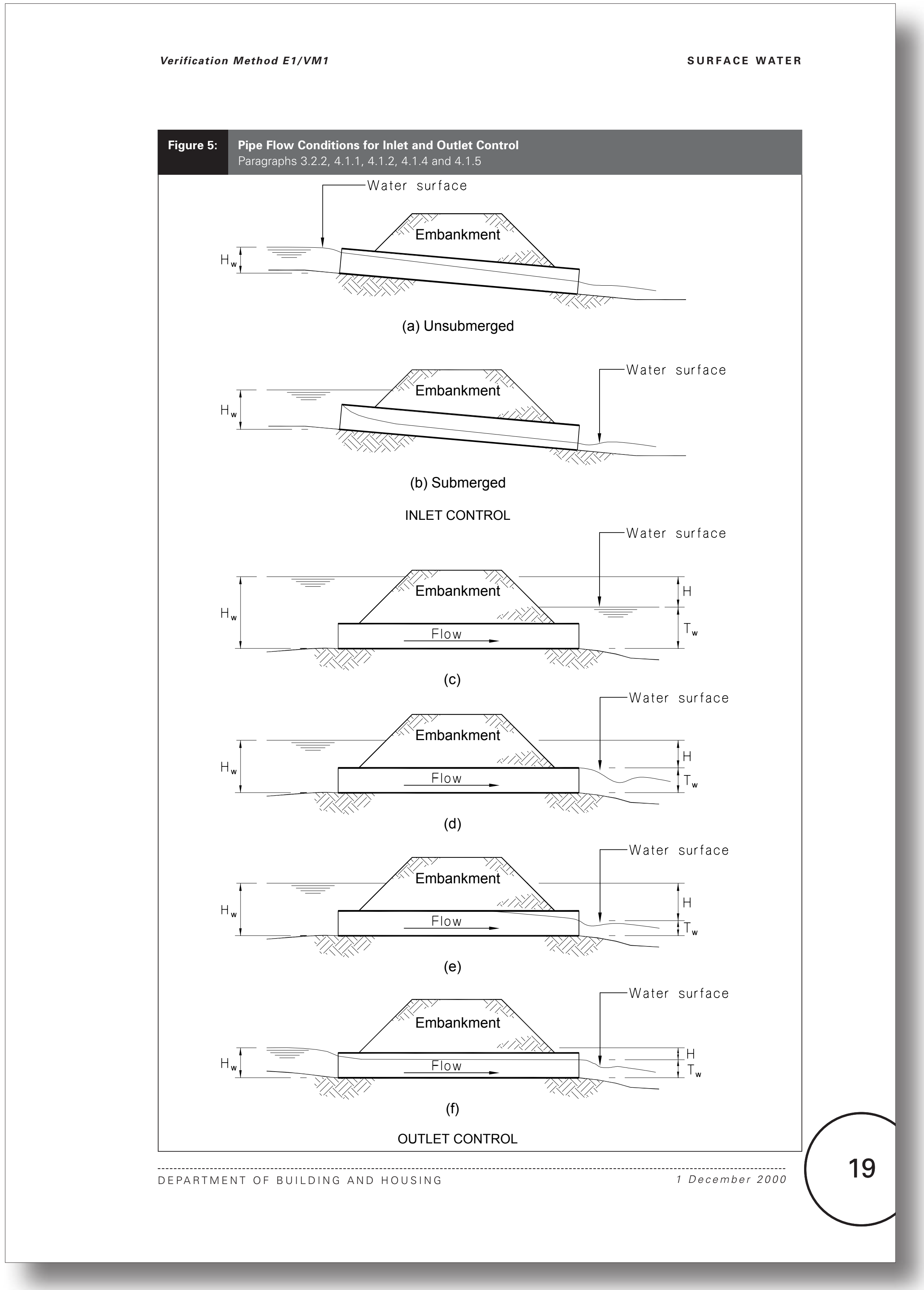

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Figure 5: **Pipe Flow Conditions for Inlet and Outlet Control**
Paragraphs 3.2.2, 4.1.1, 4.1.2, 4.1.4 and 4.1.5

(a) Unsubmerged

(b) Submerged

INLET CONTROL

(c)

(d)

(e)

(f)

OUTLET CONTROL

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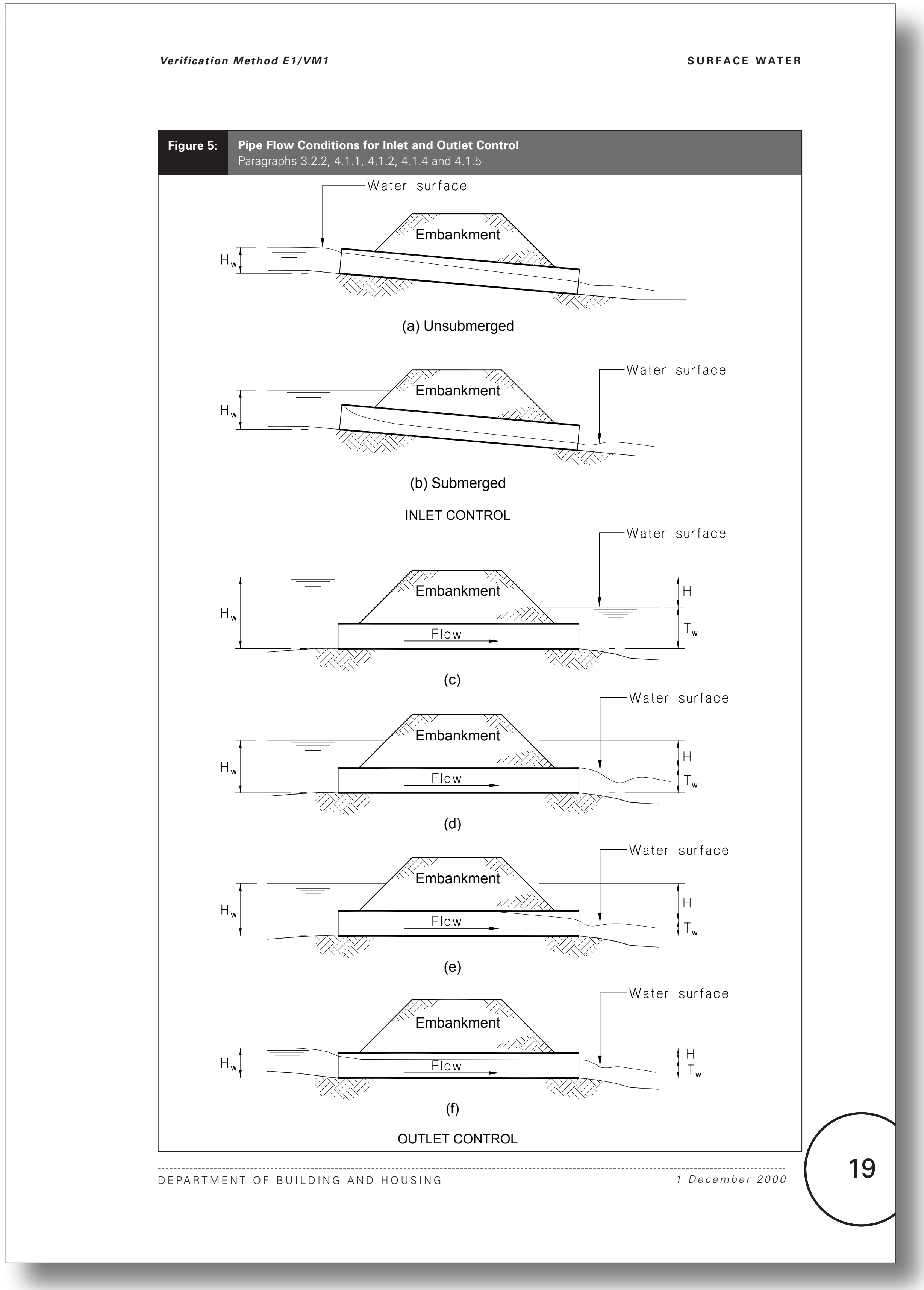

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Figure 5: **Pipe Flow Conditions for Inlet and Outlet Control**
Paragraphs 3.2.2, 4.1.1, 4.1.2, 4.1.4 and 4.1.5

(a) Unsubmerged

(b) Submerged

INLET CONTROL

(c)

(d)

(e)

(f)

OUTLET CONTROL

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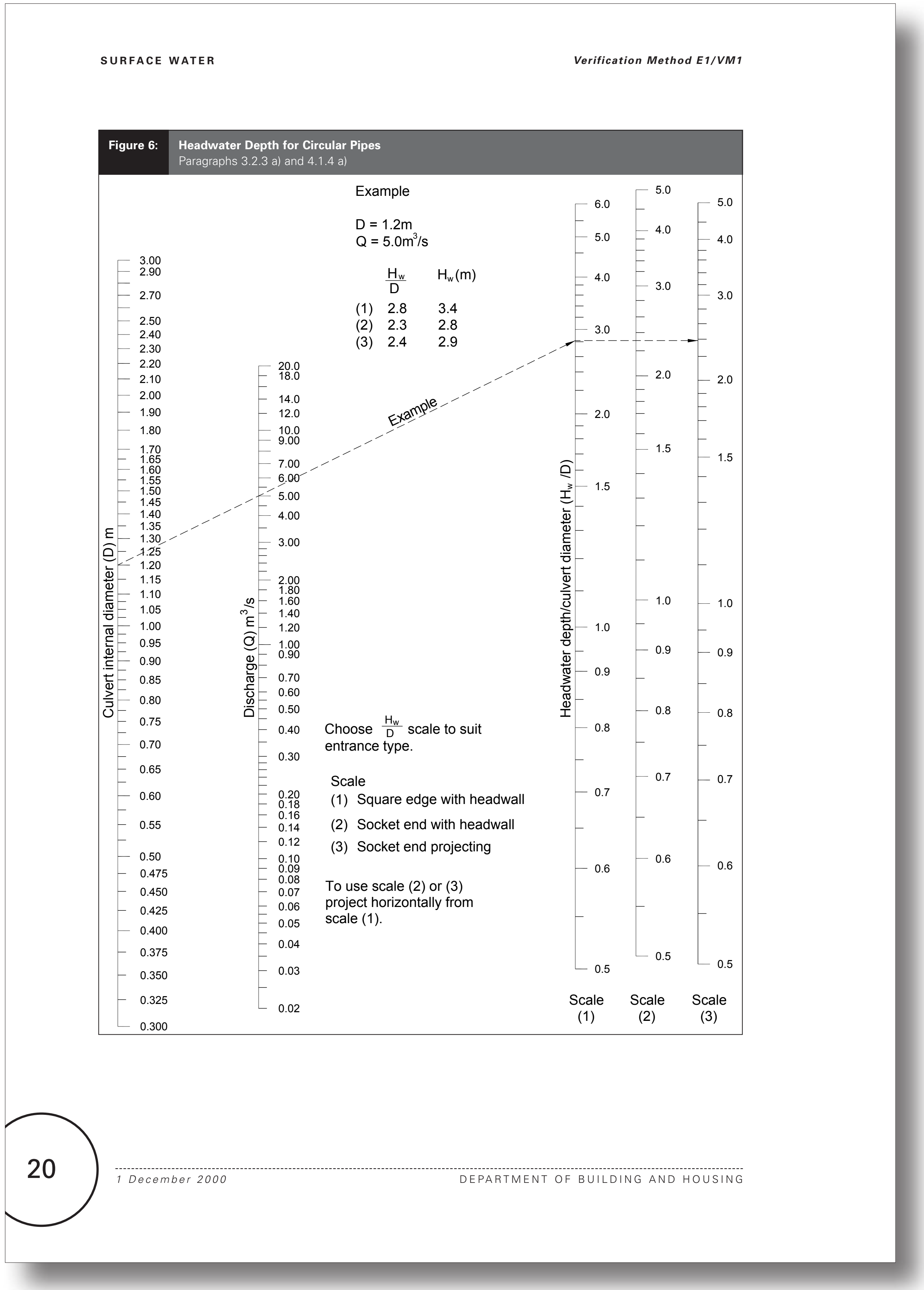

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Figure 6: **Headwater Depth for Circular Pipes**
Paragraphs 3.2.3 a) and 4.1.4 a)

Example

D = 1.2m
Q = 5.0m^3/s

	$\frac{H_w}{D}$	H_w (m)
(1)	2.8	3.4
(2)	2.3	2.8
(3)	2.4	2.9

Choose $\frac{H_w}{D}$ scale to suit entrance type.

Scale
(1) Square edge with headwall
(2) Socket end with headwall
(3) Socket end projecting

To use scale (2) or (3) project horizontally from scale (1).

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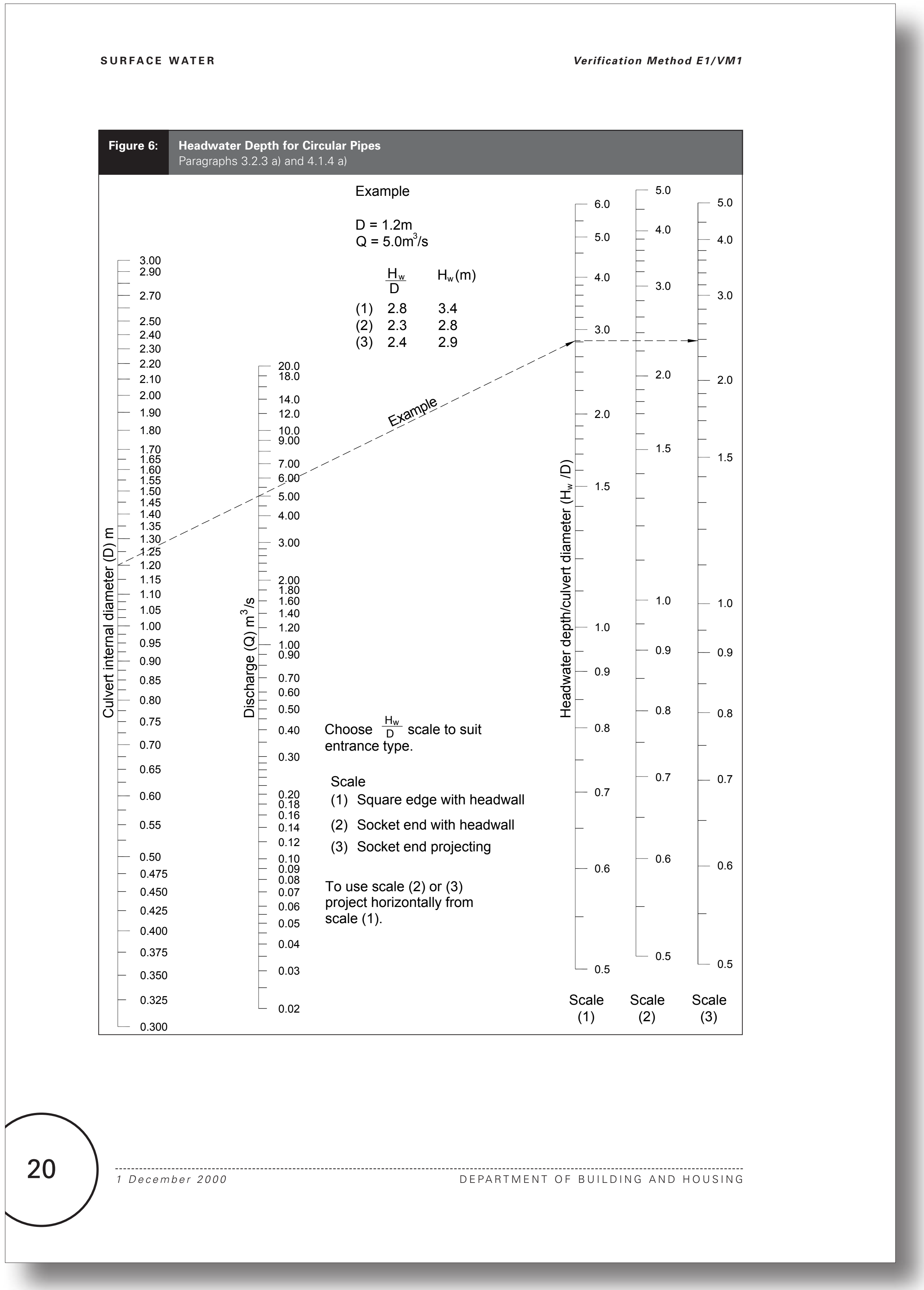

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Figure 6: **Headwater Depth for Circular Pipes**
Paragraphs 3.2.3 a) and 4.1.4 a)

Example

D = 1.2m
Q = 5.0m³/s

Hw/D Hw (m)
(1) 2.8 3.4
(2) 2.3 2.8
(3) 2.4 2.9

Choose Hw/D scale to suit entrance type.

Scale
(1) Square edge with headwall
(2) Socket end with headwall
(3) Socket end projecting

To use scale (2) or (3) project horizontally from scale (1).

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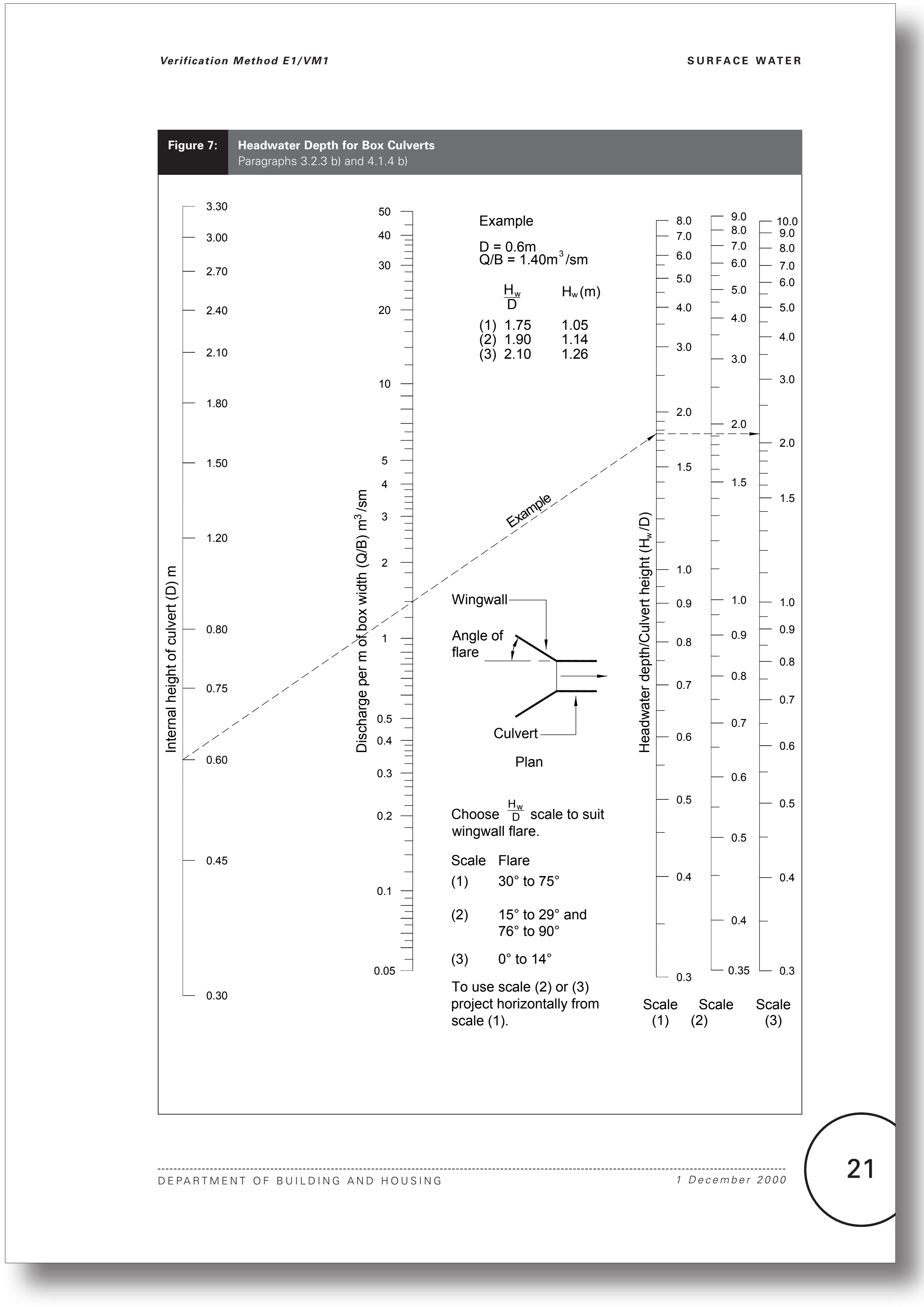

Figure 7: Headwater Depth for Box Culverts
Paragraphs 3.2.3 b) and 4.1.4 b)

Example

D = 0.6m
$Q/B = 1.40m^3/sm$

$\frac{H_w}{D}$	H_w (m)
(1) 1.75	1.05
(2) 1.90	1.14
(3) 2.10	1.26

Choose $\frac{H_w}{D}$ scale to suit wingwall flare.

Scale	Flare
(1)	30° to 75°
(2)	15° to 29° and 76° to 90°
(3)	0° to 14°

To use scale (2) or (3) project horizontally from scale (1).

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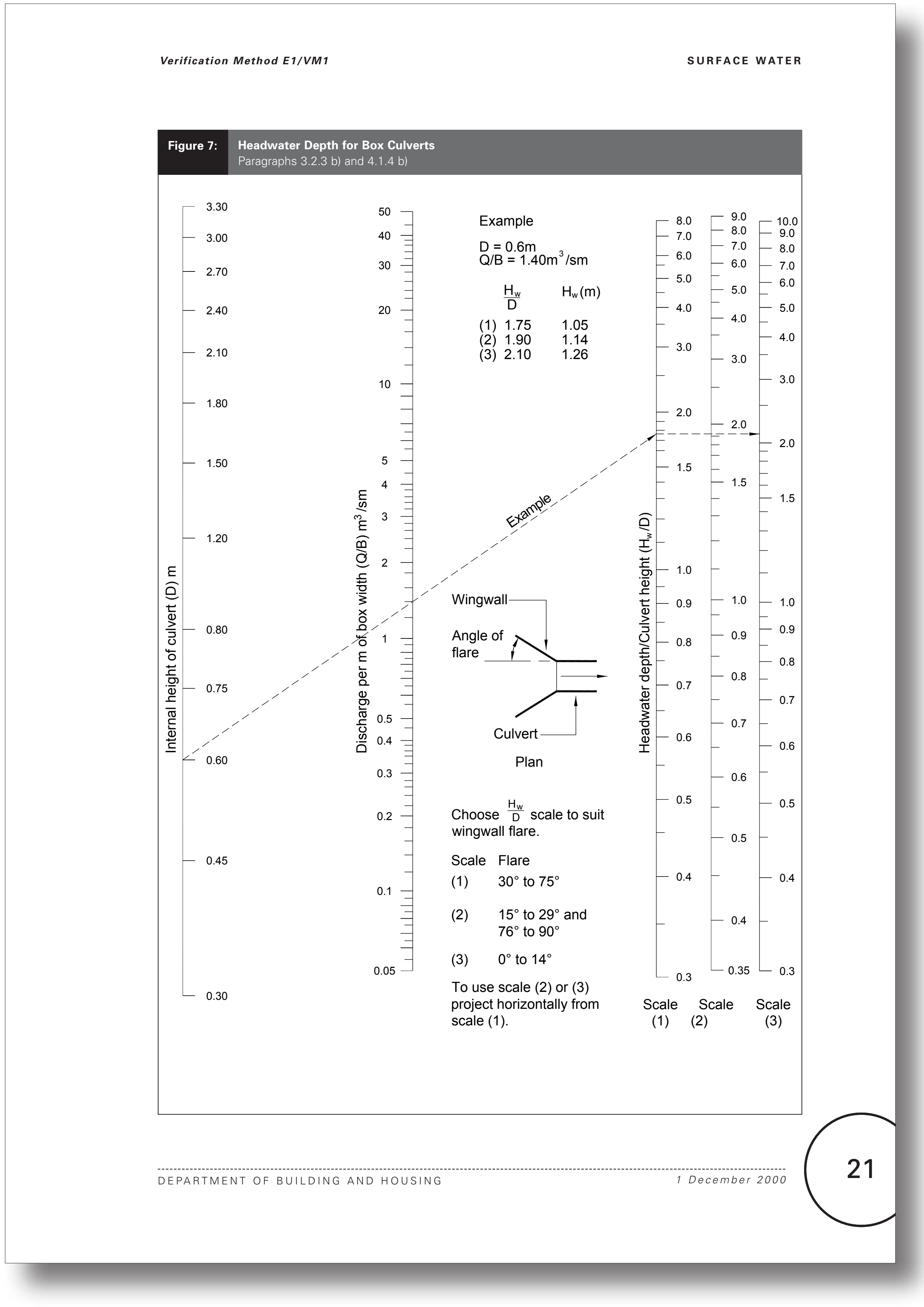

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Figure 7: Headwater Depth for Box Culverts
Paragraphs 3.2.3 b) and 4.1.4 b)

Example

D = 0.6m
Q/B = 1.40m³/sm

Hw/D Hw (m)
(1) 1.75 1.05
(2) 1.90 1.14
(3) 2.10 1.26

Choose Hw/D scale to suit wingwall flare.

Scale Flare
(1) 30° to 75°
(2) 15° to 29° and 76° to 90°
(3) 0° to 14°

To use scale (2) or (3) project horizontally from scale (1).

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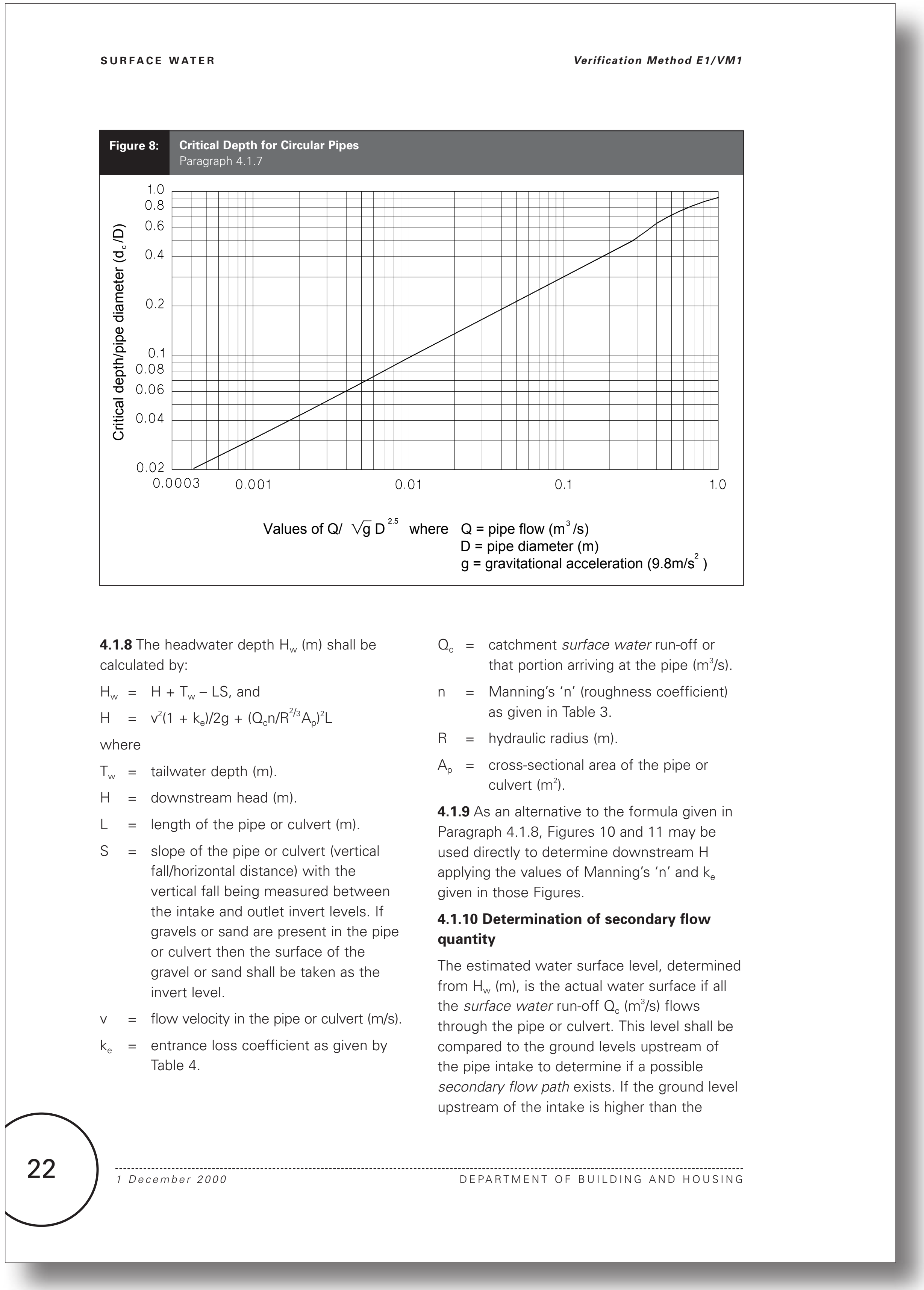

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Figure 8: **Critical Depth for Circular Pipes**
Paragraph 4.1.7

Values of $Q/\sqrt{g}\,D^{2.5}$ where Q = pipe flow (m^3/s)
D = pipe diameter (m)
g = gravitational acceleration (9.8m/s^2)

4.1.8 The headwater depth H_w (m) shall be calculated by:

H_w = $H + T_w - LS$, and

H = $v^2(1 + k_e)/2g + (Q_c n/R^{2/3}A_p)^2L$

where

T_w = tailwater depth (m).

H = downstream head (m).

L = length of the pipe or culvert (m).

S = slope of the pipe or culvert (vertical fall/horizontal distance) with the vertical fall being measured between the intake and outlet invert levels. If gravels or sand are present in the pipe or culvert then the surface of the gravel or sand shall be taken as the invert level.

v = flow velocity in the pipe or culvert (m/s).

k_e = entrance loss coefficient as given by Table 4.

Q_c = catchment *surface water* run-off or that portion arriving at the pipe (m^3/s).

n = Manning's 'n' (roughness coefficient) as given in Table 3.

R = hydraulic radius (m).

A_p = cross-sectional area of the pipe or culvert (m^2).

4.1.9 As an alternative to the formula given in Paragraph 4.1.8, Figures 10 and 11 may be used directly to determine downstream H applying the values of Manning's 'n' and k_e given in those Figures.

4.1.10 Determination of secondary flow quantity

The estimated water surface level, determined from H_w (m), is the actual water surface if all the *surface water* run-off Q_c (m^3/s) flows through the pipe or culvert. This level shall be compared to the ground levels upstream of the pipe intake to determine if a possible *secondary flow path* exists. If the ground level upstream of the intake is higher than the

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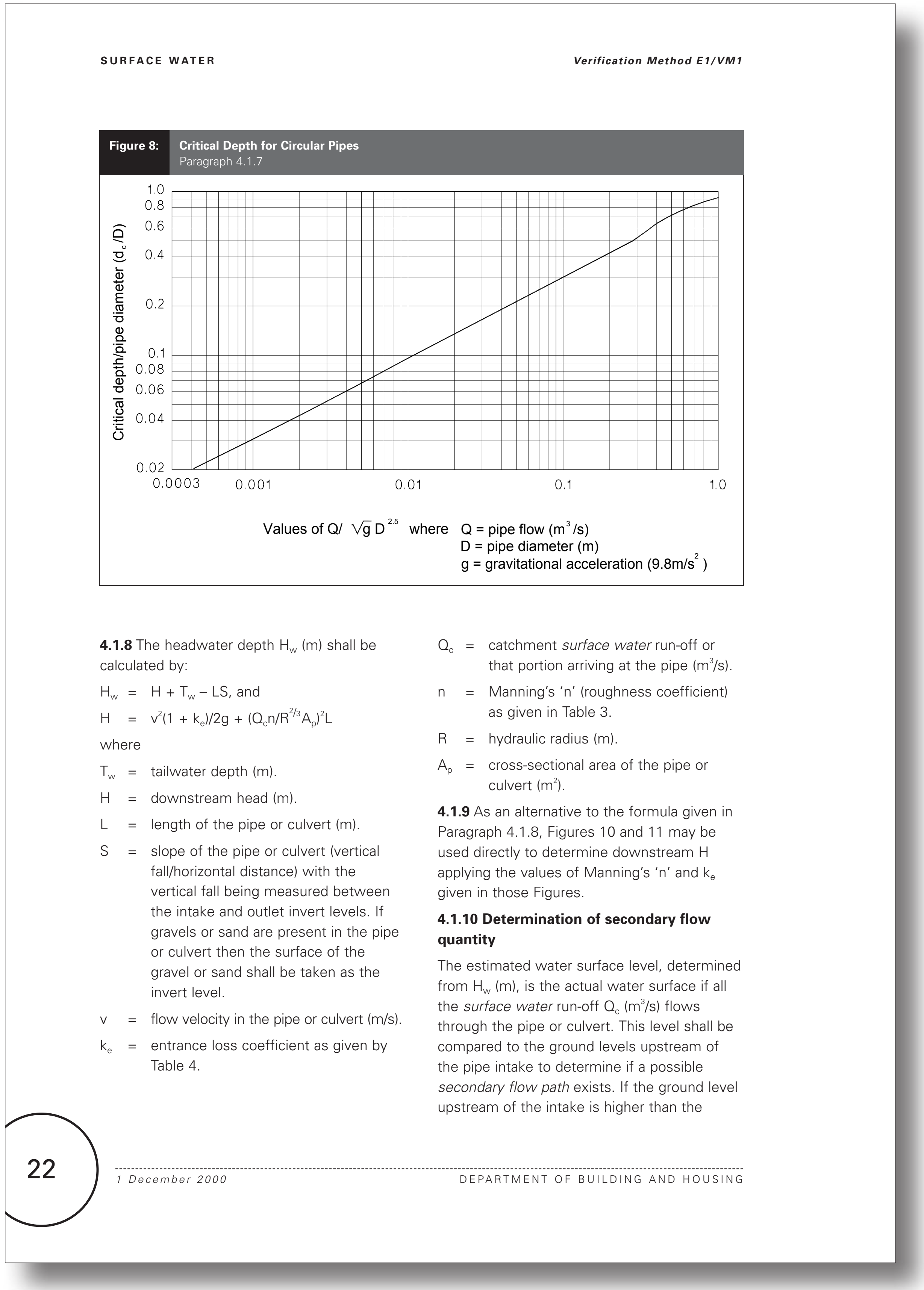

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Figure 8: **Critical Depth for Circular Pipes**
Paragraph 4.1.7

Values of $Q/\sqrt{g}\,D^{2.5}$ where Q = pipe flow (m^3/s)
D = pipe diameter (m)
g = gravitational acceleration (9.8m/s^2)

4.1.8 The headwater depth H_w (m) shall be calculated by:

H_w = $H + T_w - LS$, and

H = $v^2(1 + k_e)/2g + (Q_c n/R^{2/3}A_p)^2L$

where

T_w = tailwater depth (m).

H = downstream head (m).

L = length of the pipe or culvert (m).

S = slope of the pipe or culvert (vertical fall/horizontal distance) with the vertical fall being measured between the intake and outlet invert levels. If gravels or sand are present in the pipe or culvert then the surface of the gravel or sand shall be taken as the invert level.

v = flow velocity in the pipe or culvert (m/s).

k_e = entrance loss coefficient as given by Table 4.

Q_c = catchment *surface water* run-off or that portion arriving at the pipe (m^3/s).

n = Manning's 'n' (roughness coefficient) as given in Table 3.

R = hydraulic radius (m).

A_p = cross-sectional area of the pipe or culvert (m^2).

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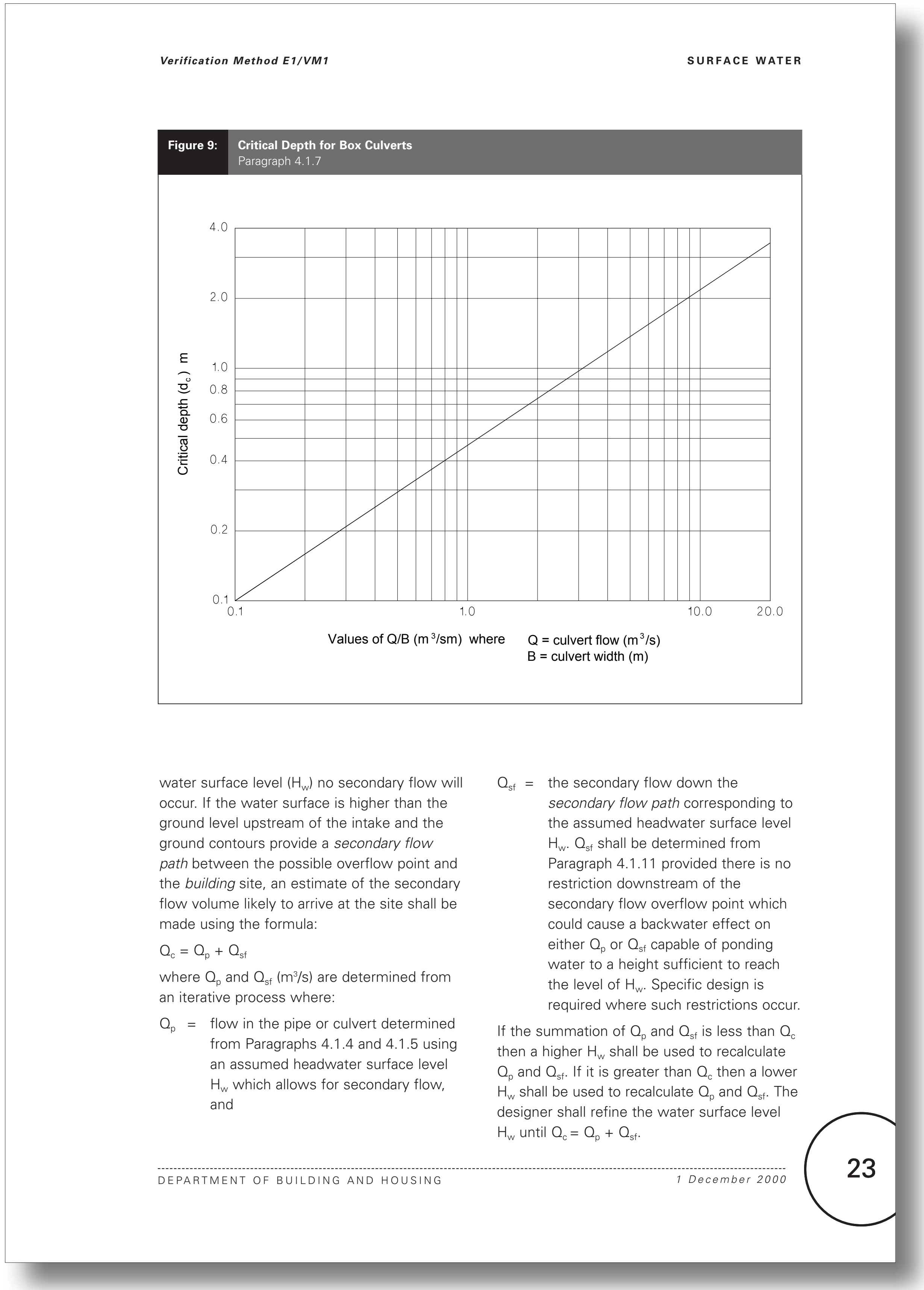

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Figure 9: **Critical Depth for Box Culverts**
Paragraph 4.1.7

water surface level (H_w) no secondary flow will occur. If the water surface is higher than the ground level upstream of the intake and the ground contours provide a *secondary flow path* between the possible overflow point and the *building* site, an estimate of the secondary flow volume likely to arrive at the site shall be made using the formula:

$Q_c = Q_p + Q_{sf}$

where Q_p and Q_{sf} (m^3/s) are determined from an iterative process where:

Q_p = flow in the pipe or culvert determined from Paragraphs 4.1.4 and 4.1.5 using an assumed headwater surface level H_w which allows for secondary flow, and

Q_{sf} = the secondary flow down the *secondary flow path* corresponding to the assumed headwater surface level H_w. Q_{sf} shall be determined from Paragraph 4.1.11 provided there is no restriction downstream of the secondary flow overflow point which could cause a backwater effect on either Q_p or Q_{sf} capable of ponding water to a height sufficient to reach the level of H_w. Specific design is required where such restrictions occur.

If the summation of Q_p and Q_{sf} is less than Q_c then a higher H_w shall be used to recalculate Q_p and Q_{sf}. If it is greater than Q_c then a lower H_w shall be used to recalculate Q_p and Q_{sf}. The designer shall refine the water surface level H_w until $Q_c = Q_p + Q_{sf}$.

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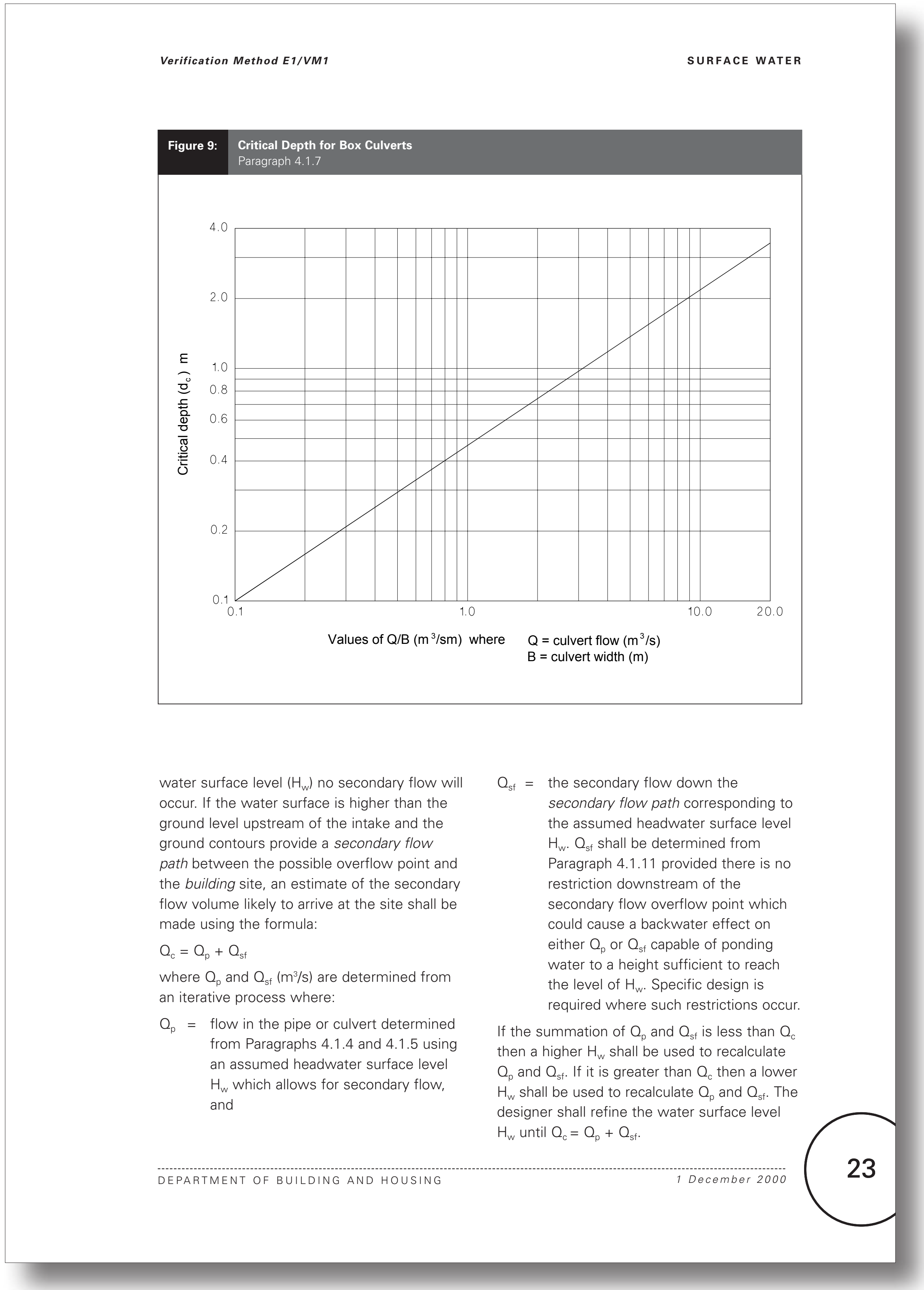

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Figure 9: **Critical Depth for Box Culverts**
Paragraph 4.1.7

water surface level (H_w) no secondary flow will occur. If the water surface is higher than the ground level upstream of the intake and the ground contours provide a *secondary flow path* between the possible overflow point and the *building* site, an estimate of the secondary flow volume likely to arrive at the site shall be made using the formula:

$Q_c = Q_p + Q_{sf}$

where Q_p and Q_{sf} (m^3/s) are determined from an iterative process where:

Q_p = flow in the pipe or culvert determined from Paragraphs 4.1.4 and 4.1.5 using an assumed headwater surface level H_w which allows for secondary flow, and

Q_{sf} = the secondary flow down the *secondary flow path* corresponding to the assumed headwater surface level H_w. Q_{sf} shall be determined from Paragraph 4.1.11 provided there is no restriction downstream of the secondary flow overflow point which could cause a backwater effect on either Q_p or Q_{sf} capable of ponding water to a height sufficient to reach the level of H_w. Specific design is required where such restrictions occur.

If the summation of Q_p and Q_{sf} is less than Q_c then a higher H_w shall be used to recalculate Q_p and Q_{sf}. If it is greater than Q_c then a lower H_w shall be used to recalculate Q_p and Q_{sf}. The designer shall refine the water surface level H_w until $Q_c = Q_p + Q_{sf}$.

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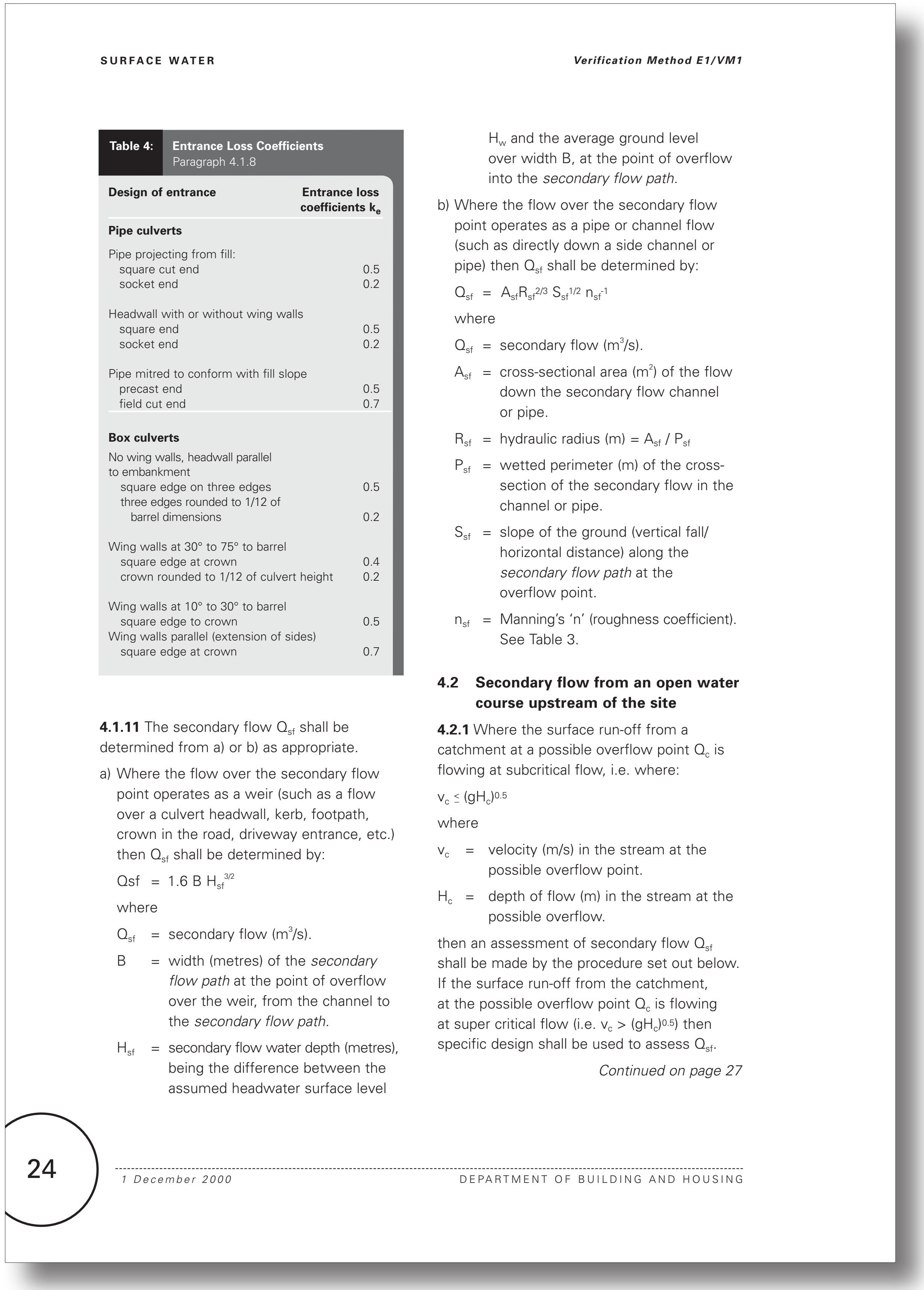

Table 4: Entrance Loss Coefficients
Paragraph 4.1.8

Design of entrance	**Entrance loss coefficients k_e**
Pipe culverts	
Pipe projecting from fill:	
square cut end	0.5
socket end	0.2
Headwall with or without wing walls	
square end	0.5
socket end	0.2
Pipe mitred to conform with fill slope	
precast end	0.5
field cut end	0.7
Box culverts	
No wing walls, headwall parallel to embankment	
square edge on three edges	0.5
three edges rounded to 1/12 of barrel dimensions	0.2
Wing walls at 30° to 75° to barrel	
square edge at crown	0.4
crown rounded to 1/12 of culvert height	0.2
Wing walls at 10° to 30° to barrel	
square edge to crown	0.5
Wing walls parallel (extension of sides)	
square edge at crown	0.7

4.1.11 The secondary flow Q_{sf} shall be determined from a) or b) as appropriate.

a) Where the flow over the secondary flow point operates as a weir (such as a flow over a culvert headwall, kerb, footpath, crown in the road, driveway entrance, etc.) then Q_{sf} shall be determined by:

Qsf = 1.6 B $H_{sf}^{3/2}$

where

Q_{sf} = secondary flow (m^3/s).

B = width (metres) of the *secondary flow path* at the point of overflow over the weir, from the channel to the *secondary flow path*.

H_{sf} = secondary flow water depth (metres), being the difference between the assumed headwater surface level H_w and the average ground level over width B, at the point of overflow into the *secondary flow path*.

b) Where the flow over the secondary flow point operates as a pipe or channel flow (such as directly down a side channel or pipe) then Q_{sf} shall be determined by:

$Q_{sf} = A_{sf}R_{sf}^{2/3}\ S_{sf}^{1/2}\ n_{sf}^{-1}$

where

Q_{sf} = secondary flow (m^3/s).

A_{sf} = cross-sectional area (m^2) of the flow down the secondary flow channel or pipe.

R_{sf} = hydraulic radius (m) = A_{sf} / P_{sf}

P_{sf} = wetted perimeter (m) of the cross-section of the secondary flow in the channel or pipe.

S_{sf} = slope of the ground (vertical fall/ horizontal distance) along the *secondary flow path* at the overflow point.

n_{sf} = Manning's 'n' (roughness coefficient). See Table 3.

4.2 Secondary flow from an open water course upstream of the site

4.2.1 Where the surface run-off from a catchment at a possible overflow point Q_c is flowing at subcritical flow, i.e. where:

$v_c \leq (gH_c)^{0.5}$

where

v_c = velocity (m/s) in the stream at the possible overflow point.

H_c = depth of flow (m) in the stream at the possible overflow.

then an assessment of secondary flow Q_{sf} shall be made by the procedure set out below. If the surface run-off from the catchment, at the possible overflow point Q_c is flowing at super critical flow (i.e. $v_c > (gH_c)^{0.5}$) then specific design shall be used to assess Q_{sf}.

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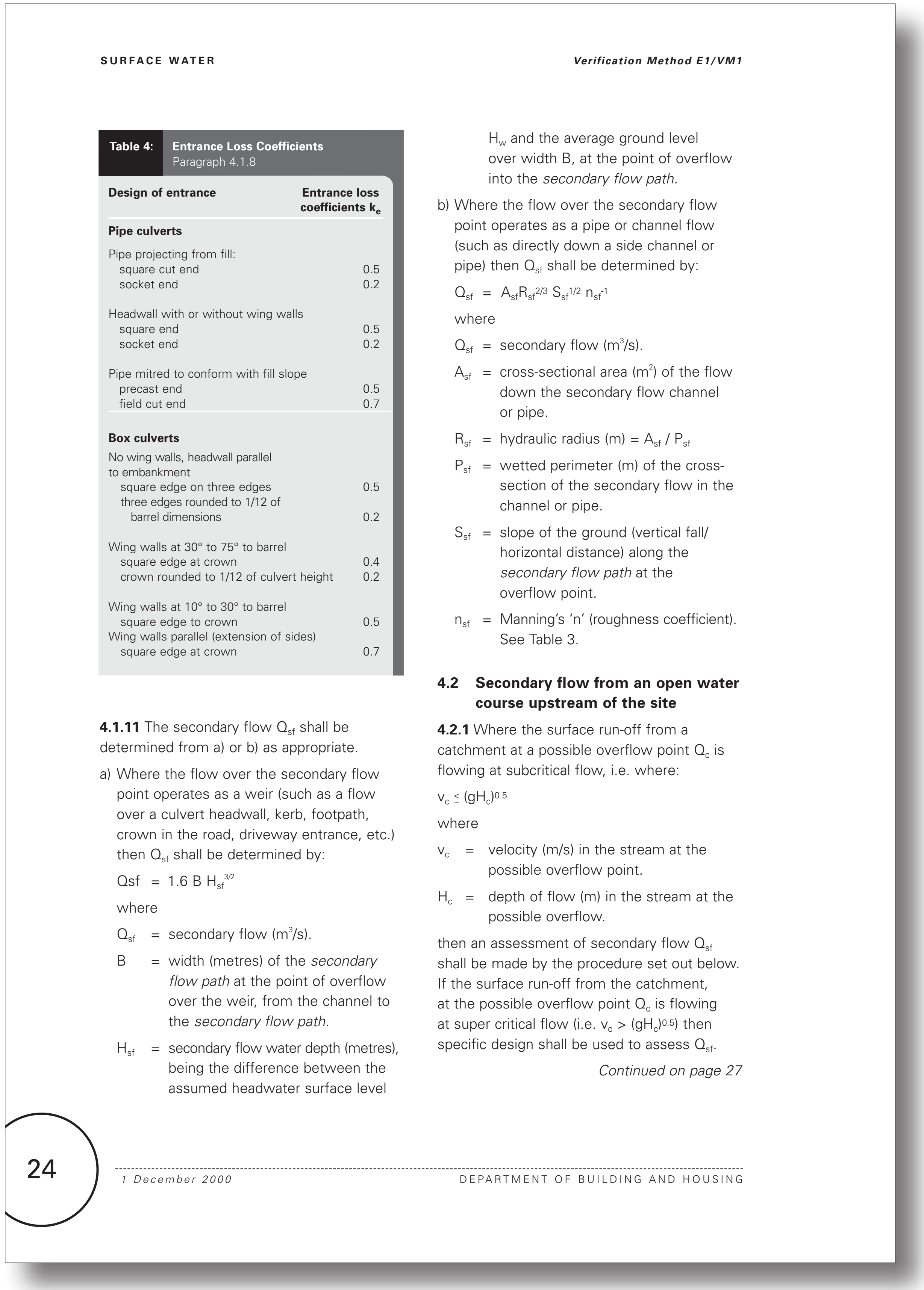

SURFACE WATER *Verification Method E1/VM1*

Table 4: Entrance Loss Coefficients
Paragraph 4.1.8

Design of entrance	**Entrance loss coefficients k_e**
Pipe culverts	
Pipe projecting from fill:	
square cut end	0.5
socket end	0.2
Headwall with or without wing walls	
square end	0.5
socket end	0.2
Pipe mitred to conform with fill slope	
precast end	0.5
field cut end	0.7
Box culverts	
No wing walls, headwall parallel to embankment	
square edge on three edges	0.5
three edges rounded to 1/12 of barrel dimensions	0.2
Wing walls at 30° to 75° to barrel	
square edge at crown	0.4
crown rounded to 1/12 of culvert height	0.2
Wing walls at 10° to 30° to barrel	
square edge to crown	0.5
Wing walls parallel (extension of sides)	
square edge at crown	0.7

4.1.11 The secondary flow Q_{sf} shall be determined from a) or b) as appropriate.

a) Where the flow over the secondary flow point operates as a weir (such as a flow over a culvert headwall, kerb, footpath, crown in the road, driveway entrance, etc.) then Q_{sf} shall be determined by:

Qsf = 1.6 B $H_{sf}^{3/2}$

where

Q_{sf} = secondary flow (m^3/s).

B = width (metres) of the *secondary flow path* at the point of overflow over the weir, from the channel to the *secondary flow path*.

H_{sf} = secondary flow water depth (metres), being the difference between the assumed headwater surface level H_w and the average ground level over width B, at the point of overflow into the *secondary flow path*.

b) Where the flow over the secondary flow point operates as a pipe or channel flow (such as directly down a side channel or pipe) then Q_{sf} shall be determined by:

$Q_{sf} = A_{sf}R_{sf}^{2/3}\ S_{sf}^{1/2}\ n_{sf}^{-1}$

where

Q_{sf} = secondary flow (m^3/s).

A_{sf} = cross-sectional area (m^2) of the flow down the secondary flow channel or pipe.

R_{sf} = hydraulic radius (m) = A_{sf} / P_{sf}

P_{sf} = wetted perimeter (m) of the cross-section of the secondary flow in the channel or pipe.

S_{sf} = slope of the ground (vertical fall/ horizontal distance) along the *secondary flow path* at the overflow point.

n_{sf} = Manning's 'n' (roughness coefficient). See Table 3.

4.2 Secondary flow from an open water course upstream of the site

4.2.1 Where the surface run-off from a catchment at a possible overflow point Q_c is flowing at subcritical flow, i.e. where:

$v_c \leq (gH_c)^{0.5}$

where

v_c = velocity (m/s) in the stream at the possible overflow point.

H_c = depth of flow (m) in the stream at the possible overflow.

then an assessment of secondary flow Q_{sf} shall be made by the procedure set out below. If the surface run-off from the catchment, at the possible overflow point Q_c is flowing at super critical flow (i.e. $v_c > (gH_c)^{0.5}$) then specific design shall be used to assess Q_{sf}.

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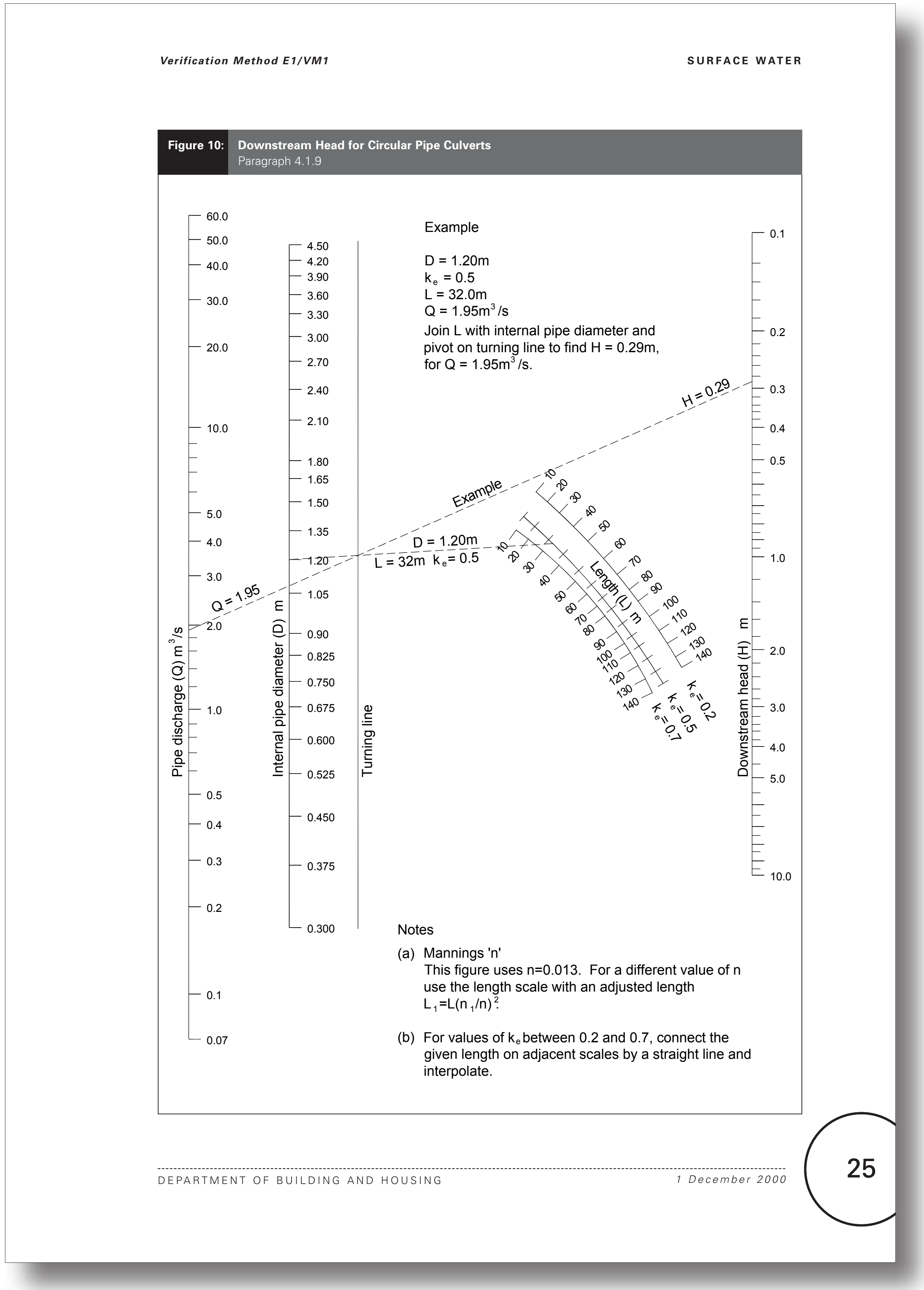

Figure 10: **Downstream Head for Circular Pipe Culverts**
Paragraph 4.1.9

Example

D = 1.20m
k_e = 0.5
L = 32.0m
Q = 1.95m^3/s

Join L with internal pipe diameter and pivot on turning line to find H = 0.29m, for Q = 1.95m^3/s.

Notes

(a) Mannings 'n'
This figure uses n=0.013. For a different value of n use the length scale with an adjusted length $L_1=L(n_1/n)^2$.

(b) For values of k_e between 0.2 and 0.7, connect the given length on adjacent scales by a straight line and interpolate.

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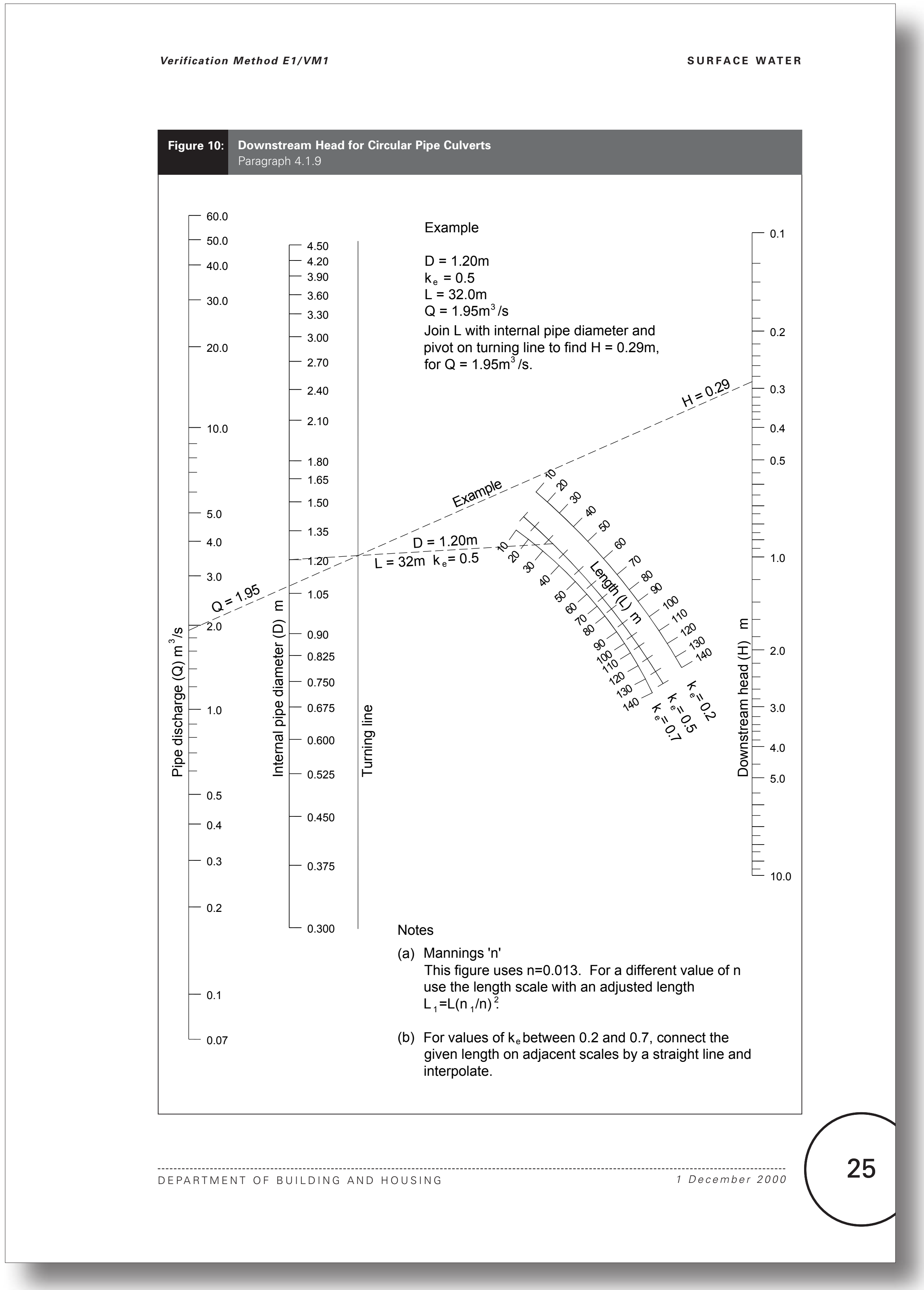

Verification Method E1/VM1 SURFACE WATER

Figure 10: **Downstream Head for Circular Pipe Culverts**
Paragraph 4.1.9

Example

D = 1.20m
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Join L with internal pipe diameter and pivot on turning line to find H = 0.29m, for Q = 1.95m^3/s.

Notes

(a) Mannings 'n'
This figure uses n=0.013. For a different value of n use the length scale with an adjusted length $L_1=L(n_1/n)^2$.

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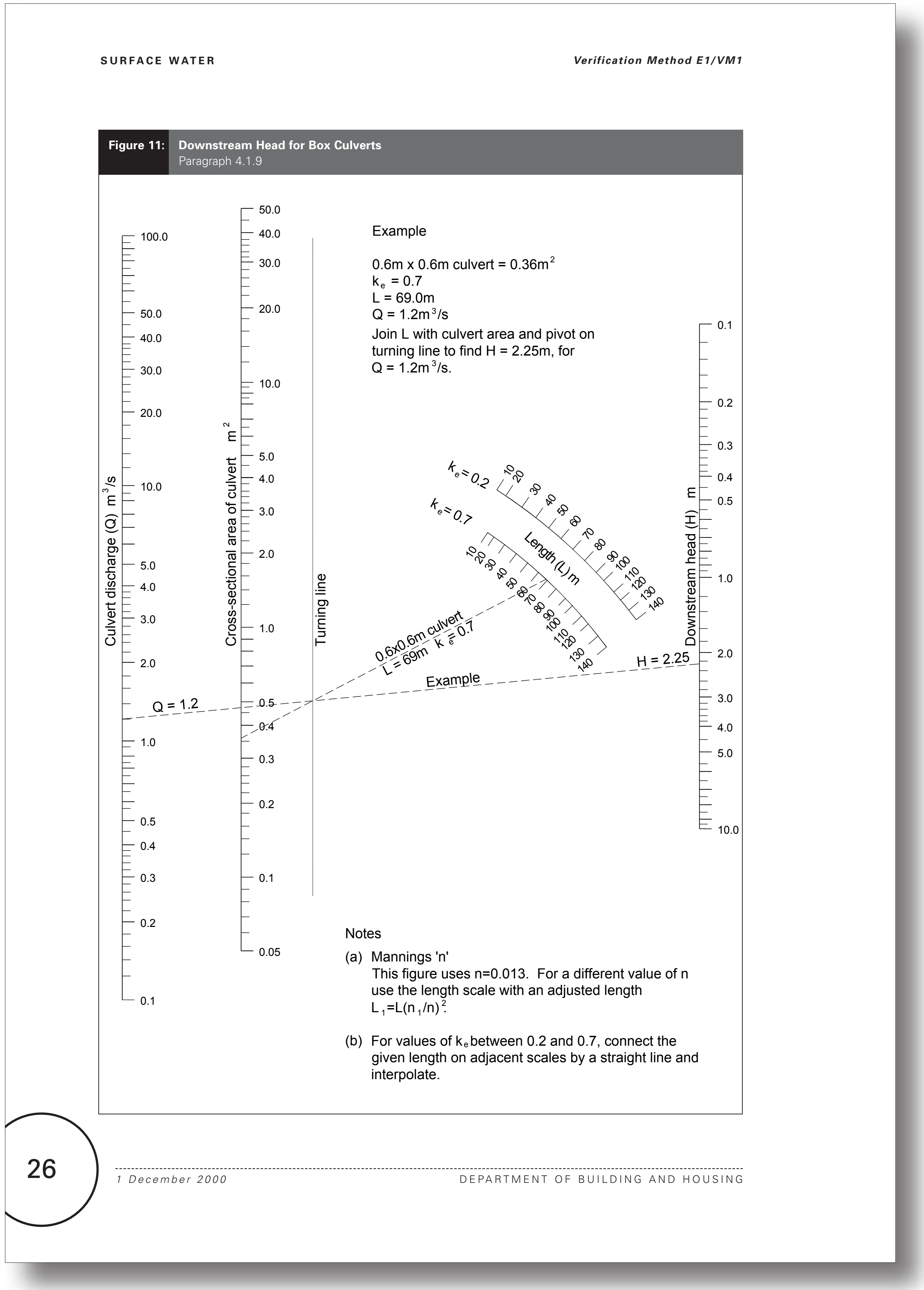
Current E1 Surface Water - No changes proposed to this page



SURFACE WATER

Verification Method E1/VM1

Figure 11: **Downstream Head for Box Culverts**
Paragraph 4.1.9

Example

0.6m x 0.6m culvert = 0.36m^2
k_e = 0.7
L = 69.0m
Q = 1.2m^3/s
Join L with culvert area and pivot on turning line to find H = 2.25m, for Q = 1.2m^3/s.

Notes

(a) Mannings 'n'
This figure uses n=0.013. For a different value of n use the length scale with an adjusted length L_1=L(n_1/n)^2.

(b) For values of k_e between 0.2 and 0.7, connect the given length on adjacent scales by a straight line and interpolate.

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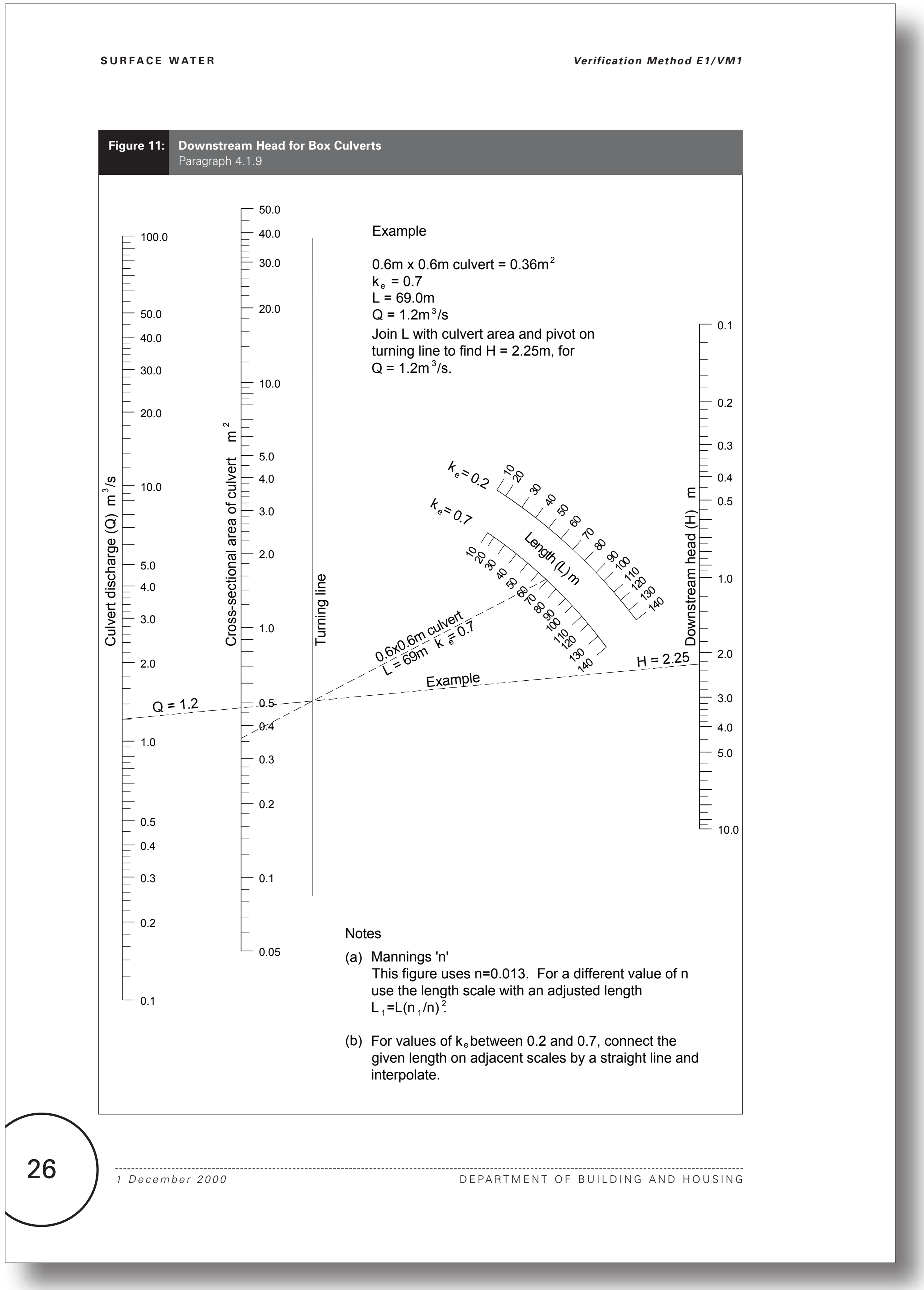
Proposed E1 Surface Water - No changes proposed to this page



SURFACE WATER

Verification Method E1/VM1

Figure 11: **Downstream Head for Box Culverts**
Paragraph 4.1.9

Example

0.6m x 0.6m culvert = 0.36m^2
k_e = 0.7
L = 69.0m
Q = 1.2m^3/s
Join L with culvert area and pivot on turning line to find H = 2.25m, for Q = 1.2m^3/s.

Notes

(a) Mannings 'n'
This figure uses n=0.013. For a different value of n use the length scale with an adjusted length L_1=L(n_1/n)^2.

(b) For values of k_e between 0.2 and 0.7, connect the given length on adjacent scales by a straight line and interpolate.

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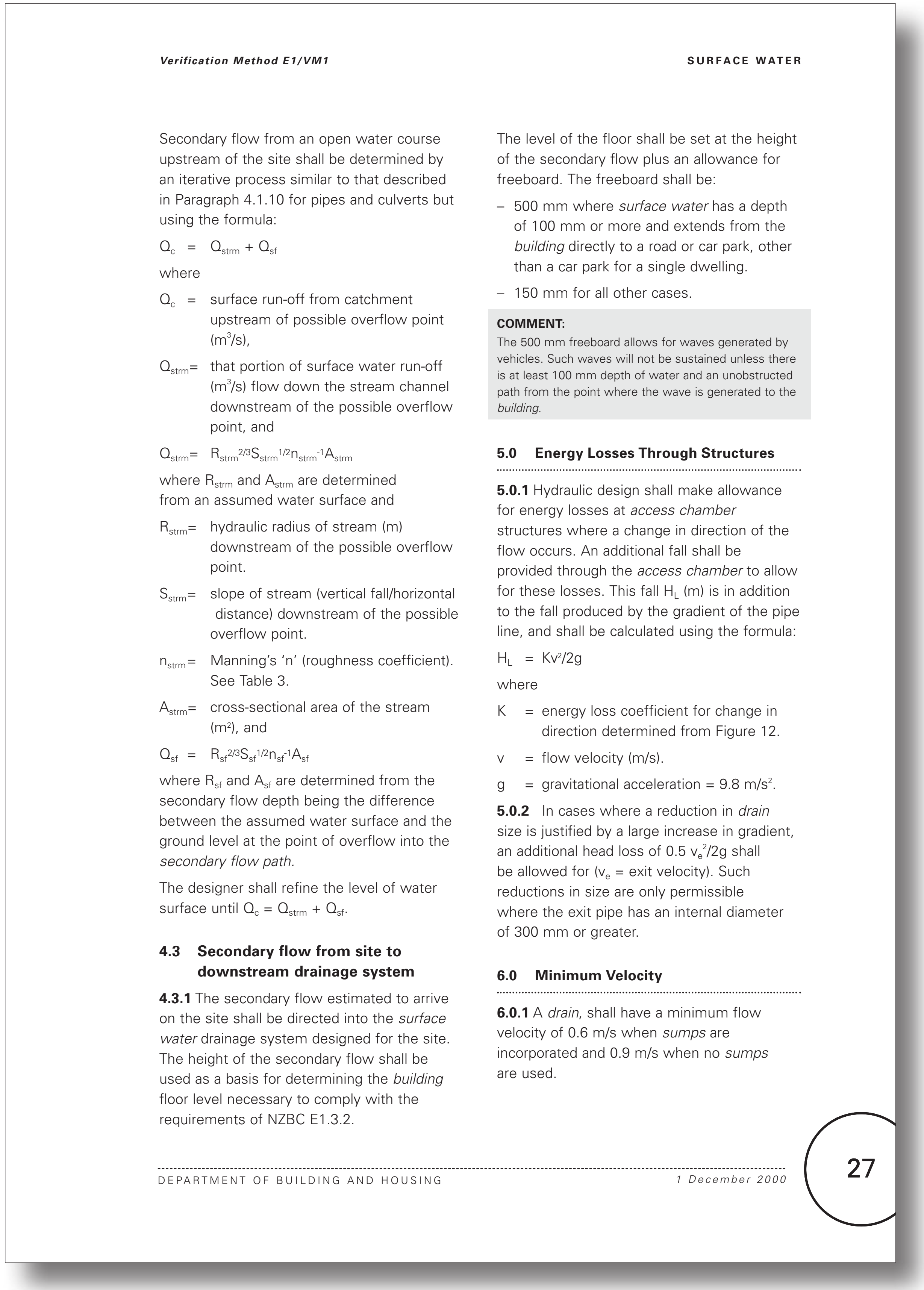
Current E1 Surface Water - No changes proposed to this page



Secondary flow from an open water course upstream of the site shall be determined by an iterative process similar to that described in Paragraph 4.1.10 for pipes and culverts but using the formula:

$Q_c = Q_{strm} + Q_{sf}$

where

Q_c = surface run-off from catchment upstream of possible overflow point (m^3/s),

Q_{strm}= that portion of surface water run-off (m^3/s) flow down the stream channel downstream of the possible overflow point, and

$Q_{strm} = R_{strm}^{2/3}S_{strm}^{1/2}n_{strm}^{-1}A_{strm}$

where R_{strm} and A_{strm} are determined from an assumed water surface and

R_{strm}= hydraulic radius of stream (m) downstream of the possible overflow point.

S_{strm}= slope of stream (vertical fall/horizontal distance) downstream of the possible overflow point.

n_{strm}= Manning's 'n' (roughness coefficient). See Table 3.

A_{strm}= cross-sectional area of the stream (m^2), and

$Q_{sf} = R_{sf}^{2/3}S_{sf}^{1/2}n_{sf}^{-1}A_{sf}$

where R_{sf} and A_{sf} are determined from the secondary flow depth being the difference between the assumed water surface and the ground level at the point of overflow into the *secondary flow path*.

The designer shall refine the level of water surface until $Q_c = Q_{strm} + Q_{sf}$.

4.3 Secondary flow from site to downstream drainage system

4.3.1 The secondary flow estimated to arrive on the site shall be directed into the *surface water* drainage system designed for the site. The height of the secondary flow shall be used as a basis for determining the *building* floor level necessary to comply with the requirements of NZBC E1.3.2.

The level of the floor shall be set at the height of the secondary flow plus an allowance for freeboard. The freeboard shall be:

- 500 mm where *surface water* has a depth of 100 mm or more and extends from the *building* directly to a road or car park, other than a car park for a single dwelling.
- 150 mm for all other cases.

COMMENT:
The 500 mm freeboard allows for waves generated by vehicles. Such waves will not be sustained unless there is at least 100 mm depth of water and an unobstructed path from the point where the wave is generated to the *building*.

5.0 Energy Losses Through Structures

5.0.1 Hydraulic design shall make allowance for energy losses at *access chamber* structures where a change in direction of the flow occurs. An additional fall shall be provided through the *access chamber* to allow for these losses. This fall H_L (m) is in addition to the fall produced by the gradient of the pipe line, and shall be calculated using the formula:

$H_L = Kv^2/2g$

where

K = energy loss coefficient for change in direction determined from Figure 12.

v = flow velocity (m/s).

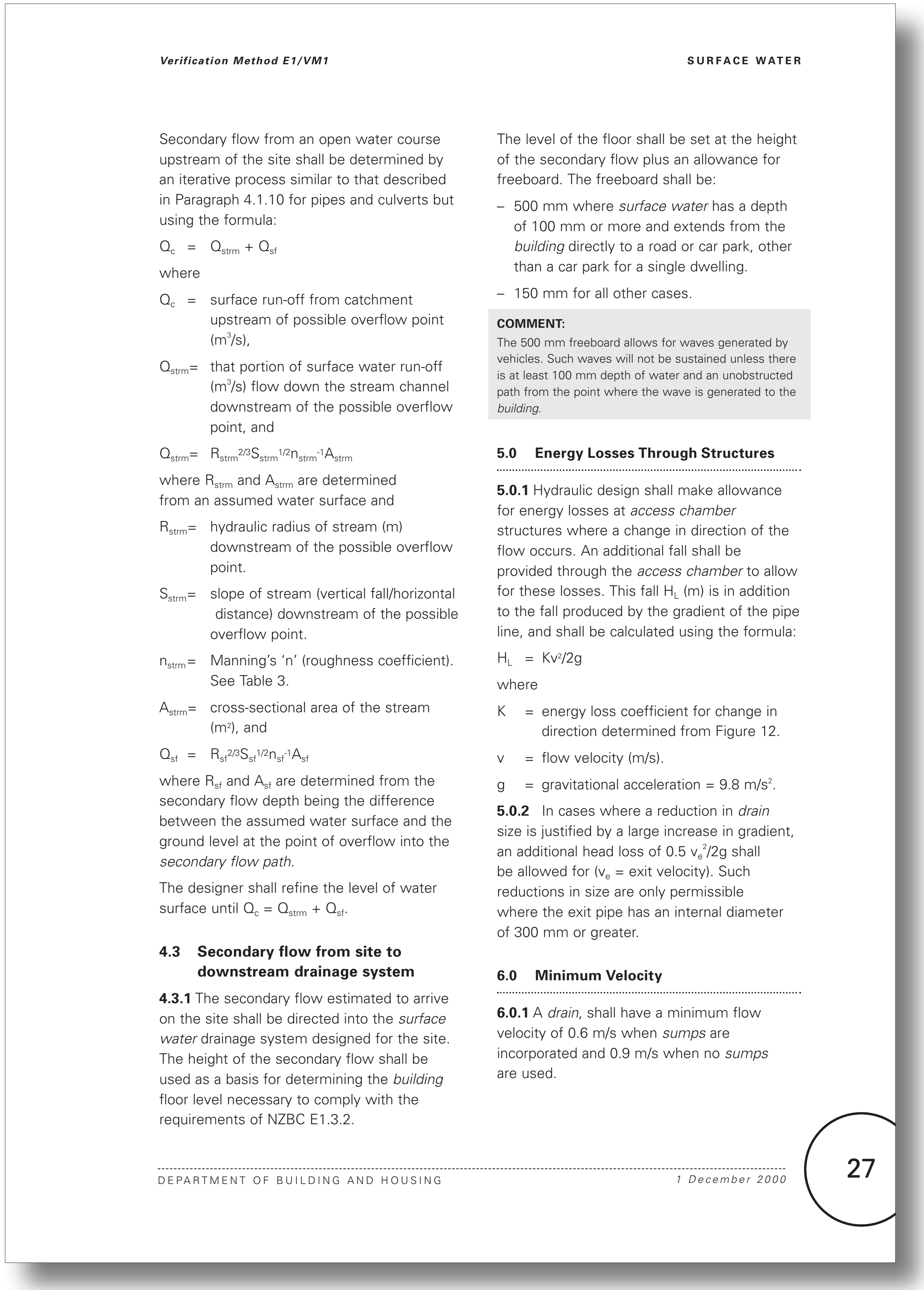
g = gravitational acceleration = 9.8 m/s^2.

5.0.2 In cases where a reduction in *drain* size is justified by a large increase in gradient, an additional head loss of 0.5 $v_e^2/2g$ shall be allowed for (v_e = exit velocity). Such reductions in size are only permissible where the exit pipe has an internal diameter of 300 mm or greater.

6.0 Minimum Velocity

6.0.1 A *drain*, shall have a minimum flow velocity of 0.6 m/s when *sumps* are incorporated and 0.9 m/s when no *sumps* are used.

Proposed E1 Surface Water - No changes proposed to this page



Verification Method E1/VM1 SURFACE WATER

Secondary flow from an open water course upstream of the site shall be determined by an iterative process similar to that described in Paragraph 4.1.10 for pipes and culverts but using the formula:

$Q_c = Q_{strm} + Q_{sf}$

where

Q_c = surface run-off from catchment upstream of possible overflow point (m^3/s),

Q_{strm}= that portion of surface water run-off (m^3/s) flow down the stream channel downstream of the possible overflow point, and

$Q_{strm} = R_{strm}^{2/3}S_{strm}^{1/2}n_{strm}^{-1}A_{strm}$

where R_{strm} and A_{strm} are determined from an assumed water surface and

R_{strm}= hydraulic radius of stream (m) downstream of the possible overflow point.

S_{strm}= slope of stream (vertical fall/horizontal distance) downstream of the possible overflow point.

n_{strm}= Manning's 'n' (roughness coefficient). See Table 3.

A_{strm}= cross-sectional area of the stream (m^2), and

$Q_{sf} = R_{sf}^{2/3}S_{sf}^{1/2}n_{sf}^{-1}A_{sf}$

where R_{sf} and A_{sf} are determined from the secondary flow depth being the difference between the assumed water surface and the ground level at the point of overflow into the *secondary flow path*.

The designer shall refine the level of water surface until $Q_c = Q_{strm} + Q_{sf}$.

4.3 Secondary flow from site to downstream drainage system

4.3.1 The secondary flow estimated to arrive on the site shall be directed into the *surface water* drainage system designed for the site. The height of the secondary flow shall be used as a basis for determining the *building* floor level necessary to comply with the requirements of NZBC E1.3.2.

The level of the floor shall be set at the height of the secondary flow plus an allowance for freeboard. The freeboard shall be:

- 500 mm where *surface water* has a depth of 100 mm or more and extends from the *building* directly to a road or car park, other than a car park for a single dwelling.
- 150 mm for all other cases.

COMMENT:
The 500 mm freeboard allows for waves generated by vehicles. Such waves will not be sustained unless there is at least 100 mm depth of water and an unobstructed path from the point where the wave is generated to the *building*.

5.0 Energy Losses Through Structures

5.0.1 Hydraulic design shall make allowance for energy losses at *access chamber* structures where a change in direction of the flow occurs. An additional fall shall be provided through the *access chamber* to allow for these losses. This fall H_L (m) is in addition to the fall produced by the gradient of the pipe line, and shall be calculated using the formula:

$H_L = Kv^2/2g$

where

K = energy loss coefficient for change in direction determined from Figure 12.

v = flow velocity (m/s).

g = gravitational acceleration = 9.8 m/s^2.

5.0.2 In cases where a reduction in *drain* size is justified by a large increase in gradient, an additional head loss of 0.5 $v_e^2/2g$ shall be allowed for (v_e = exit velocity). Such reductions in size are only permissible where the exit pipe has an internal diameter of 300 mm or greater.

6.0 Minimum Velocity

6.0.1 A *drain*, shall have a minimum flow velocity of 0.6 m/s when *sumps* are incorporated and 0.9 m/s when no *sumps* are used.

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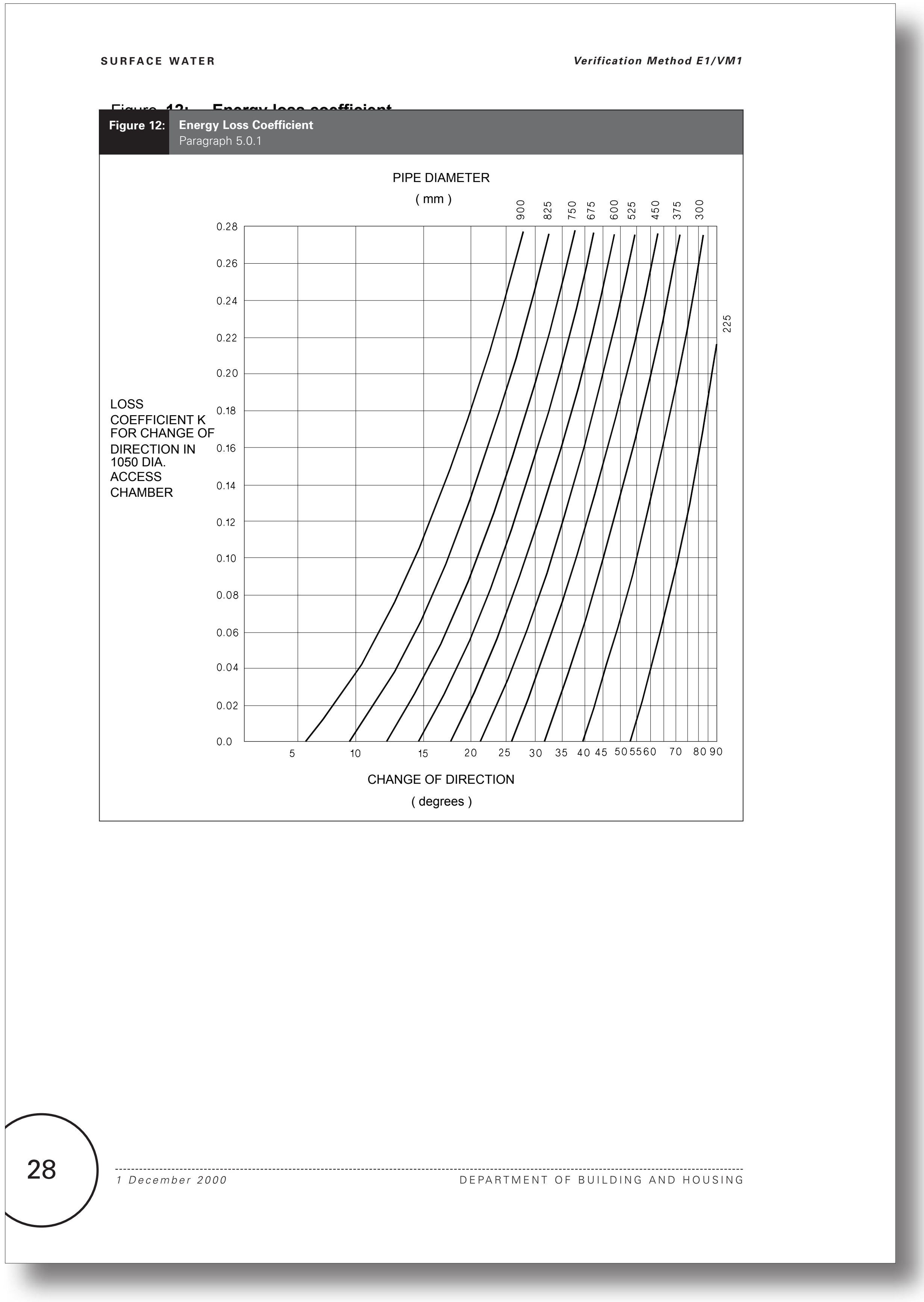

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Figure 12: **Energy Loss Coefficient**
Paragraph 5.0.1

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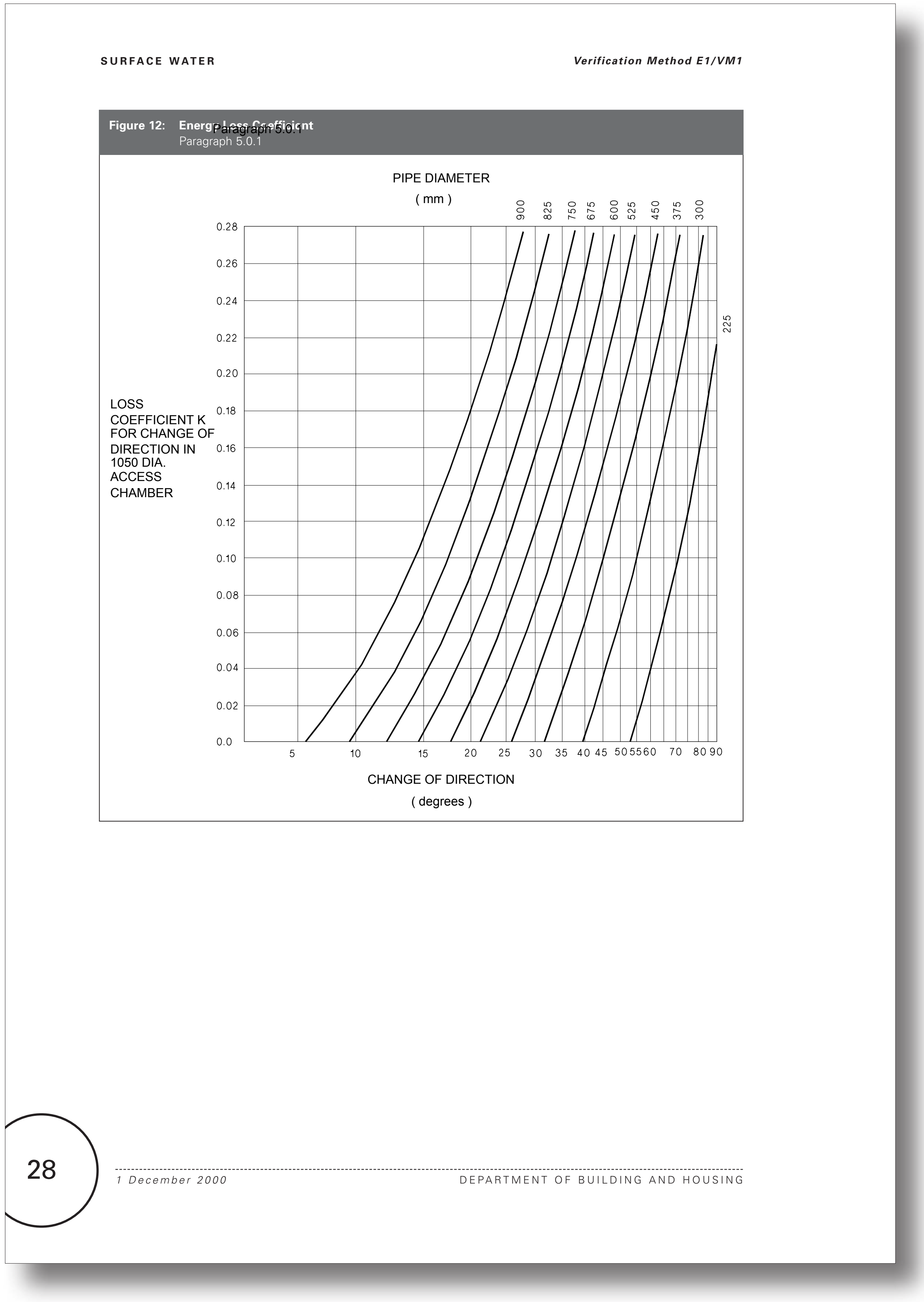
SURFACE WATER

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Figure 12: **Energy Loss Coefficient**
Paragraph 5.0.1

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Appendix A. Proposed changes to the acceptable solutions and verification methods for clause E1 Surface Water

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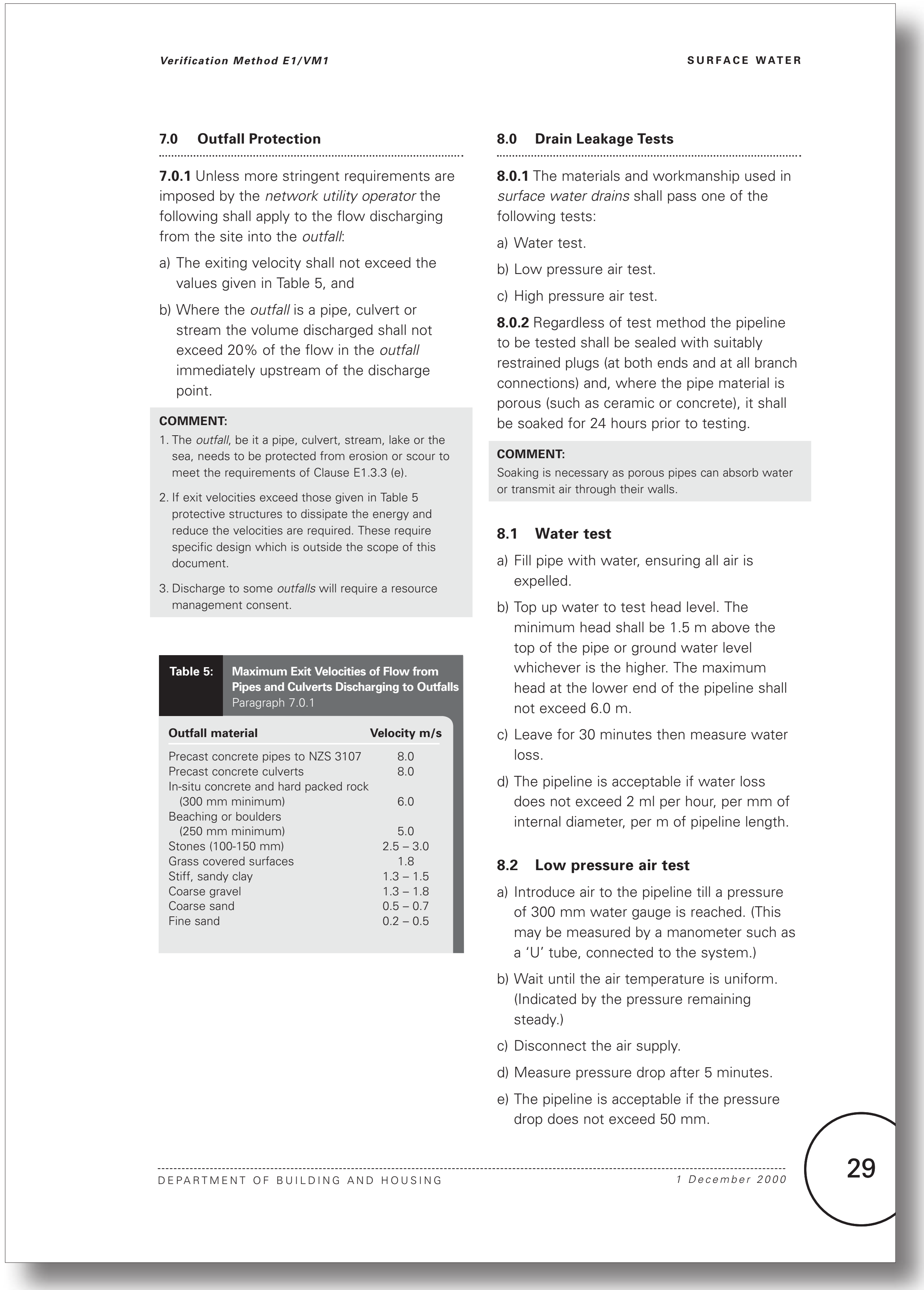

7.0 Outfall Protection

7.0.1 Unless more stringent requirements are imposed by the *network utility operator* the following shall apply to the flow discharging from the site into the *outfall*:

a) The exiting velocity shall not exceed the values given in Table 5, and

b) Where the *outfall* is a pipe, culvert or stream the volume discharged shall not exceed 20% of the flow in the *outfall* immediately upstream of the discharge point.

COMMENT:

1. The *outfall*, be it a pipe, culvert, stream, lake or the sea, needs to be protected from erosion or scour to meet the requirements of Clause E1.3.3 (e).
2. If exit velocities exceed those given in Table 5 protective structures to dissipate the energy and reduce the velocities are required. These require specific design which is outside the scope of this document.
3. Discharge to some *outfalls* will require a resource management consent.

Table 5: Maximum Exit Velocities of Flow from Pipes and Culverts Discharging to Outfalls
Paragraph 7.0.1

Outfall material	Velocity m/s
Precast concrete pipes to NZS 3107	8.0
Precast concrete culverts	8.0
In-situ concrete and hard packed rock (300 mm minimum)	6.0
Beaching or boulders (250 mm minimum)	5.0
Stones (100-150 mm)	2.5 – 3.0
Grass covered surfaces	1.8
Stiff, sandy clay	1.3 – 1.5
Coarse gravel	1.3 – 1.8
Coarse sand	0.5 – 0.7
Fine sand	0.2 – 0.5

8.0 Drain Leakage Tests

8.0.1 The materials and workmanship used in *surface water drains* shall pass one of the following tests:

a) Water test.

b) Low pressure air test.

c) High pressure air test.

8.0.2 Regardless of test method the pipeline to be tested shall be sealed with suitably restrained plugs (at both ends and at all branch connections) and, where the pipe material is porous (such as ceramic or concrete), it shall be soaked for 24 hours prior to testing.

COMMENT:

Soaking is necessary as porous pipes can absorb water or transmit air through their walls.

8.1 Water test

a) Fill pipe with water, ensuring all air is expelled.

b) Top up water to test head level. The minimum head shall be 1.5 m above the top of the pipe or ground water level whichever is the higher. The maximum head at the lower end of the pipeline shall not exceed 6.0 m.

c) Leave for 30 minutes then measure water loss.

d) The pipeline is acceptable if water loss does not exceed 2 ml per hour, per mm of internal diameter, per m of pipeline length.

8.2 Low pressure air test

a) Introduce air to the pipeline till a pressure of 300 mm water gauge is reached. (This may be measured by a manometer such as a 'U' tube, connected to the system.)

b) Wait until the air temperature is uniform. (Indicated by the pressure remaining steady.)

c) Disconnect the air supply.

d) Measure pressure drop after 5 minutes.

e) The pipeline is acceptable if the pressure drop does not exceed 50 mm.

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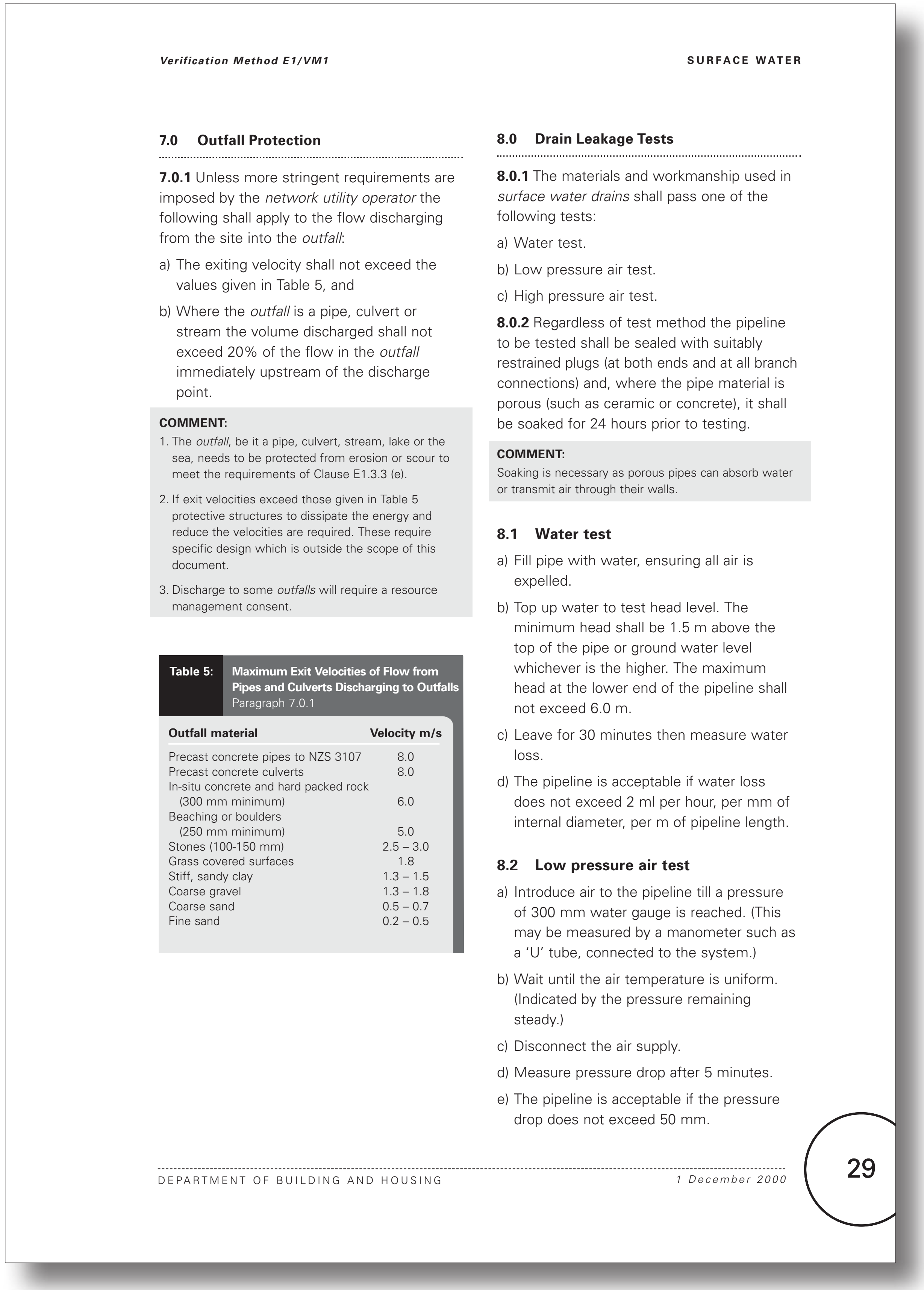

Verification Method E1/VM1 SURFACE WATER

7.0 Outfall Protection

7.0.1 Unless more stringent requirements are imposed by the *network utility operator* the following shall apply to the flow discharging from the site into the *outfall*:

a) The exiting velocity shall not exceed the values given in Table 5, and

b) Where the *outfall* is a pipe, culvert or stream the volume discharged shall not exceed 20% of the flow in the *outfall* immediately upstream of the discharge point.

COMMENT:

1. The *outfall*, be it a pipe, culvert, stream, lake or the sea, needs to be protected from erosion or scour to meet the requirements of Clause E1.3.3 (e).
2. If exit velocities exceed those given in Table 5 protective structures to dissipate the energy and reduce the velocities are required. These require specific design which is outside the scope of this document.
3. Discharge to some *outfalls* will require a resource management consent.

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Stones (100-150 mm)	2.5 – 3.0
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Coarse sand	0.5 – 0.7
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8.0.1 The materials and workmanship used in *surface water drains* shall pass one of the following tests:

a) Water test.

b) Low pressure air test.

c) High pressure air test.

8.0.2 Regardless of test method the pipeline to be tested shall be sealed with suitably restrained plugs (at both ends and at all branch connections) and, where the pipe material is porous (such as ceramic or concrete), it shall be soaked for 24 hours prior to testing.

COMMENT:

Soaking is necessary as porous pipes can absorb water or transmit air through their walls.

8.1 Water test

a) Fill pipe with water, ensuring all air is expelled.

b) Top up water to test head level. The minimum head shall be 1.5 m above the top of the pipe or ground water level whichever is the higher. The maximum head at the lower end of the pipeline shall not exceed 6.0 m.

c) Leave for 30 minutes then measure water loss.

d) The pipeline is acceptable if water loss does not exceed 2 ml per hour, per mm of internal diameter, per m of pipeline length.

8.2 Low pressure air test

a) Introduce air to the pipeline till a pressure of 300 mm water gauge is reached. (This may be measured by a manometer such as a 'U' tube, connected to the system.)

b) Wait until the air temperature is uniform. (Indicated by the pressure remaining steady.)

c) Disconnect the air supply.

d) Measure pressure drop after 5 minutes.

e) The pipeline is acceptable if the pressure drop does not exceed 50 mm.

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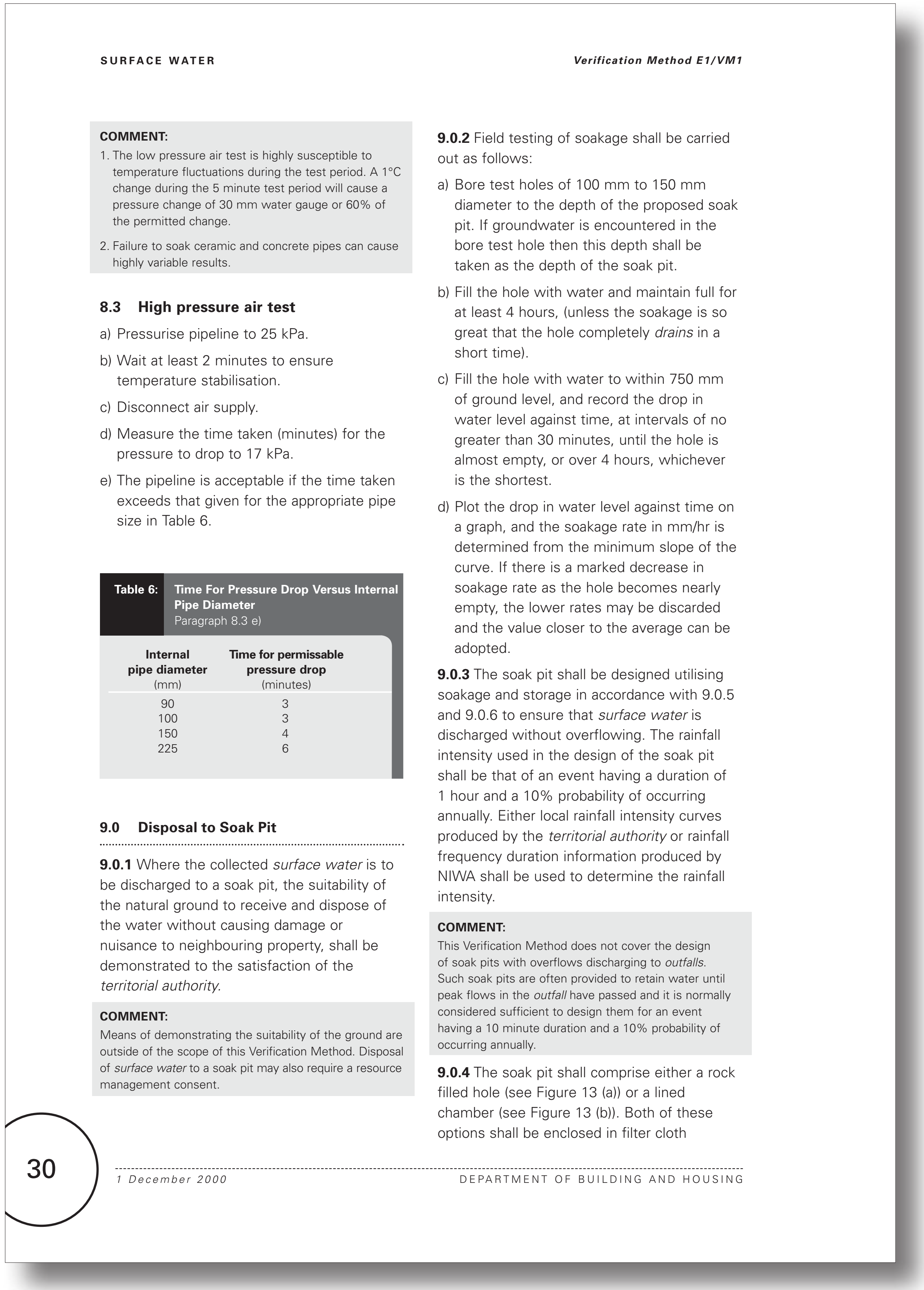

SURFACE WATER

Verification Method E1/VM1

COMMENT:

1. The low pressure air test is highly susceptible to temperature fluctuations during the test period. A 1°C change during the 5 minute test period will cause a pressure change of 30 mm water gauge or 60% of the permitted change.
2. Failure to soak ceramic and concrete pipes can cause highly variable results.

8.3 High pressure air test

a) Pressurise pipeline to 25 kPa.

b) Wait at least 2 minutes to ensure temperature stabilisation.

c) Disconnect air supply.

d) Measure the time taken (minutes) for the pressure to drop to 17 kPa.

e) The pipeline is acceptable if the time taken exceeds that given for the appropriate pipe size in Table 6.

Table 6: Time For Pressure Drop Versus Internal Pipe Diameter
Paragraph 8.3 e)

Internal pipe diameter (mm)	Time for permissable pressure drop (minutes)
90	3
100	3
150	4
225	6

9.0 Disposal to Soak Pit

9.0.1 Where the collected *surface water* is to be discharged to a soak pit, the suitability of the natural ground to receive and dispose of the water without causing damage or nuisance to neighbouring property, shall be demonstrated to the satisfaction of the *territorial authority.*

COMMENT:

Means of demonstrating the suitability of the ground are outside of the scope of this Verification Method. Disposal of *surface water* to a soak pit may also require a resource management consent.

9.0.2 Field testing of soakage shall be carried out as follows:

a) Bore test holes of 100 mm to 150 mm diameter to the depth of the proposed soak pit. If groundwater is encountered in the bore test hole then this depth shall be taken as the depth of the soak pit.

b) Fill the hole with water and maintain full for at least 4 hours, (unless the soakage is so great that the hole completely *drains* in a short time).

c) Fill the hole with water to within 750 mm of ground level, and record the drop in water level against time, at intervals of no greater than 30 minutes, until the hole is almost empty, or over 4 hours, whichever is the shortest.

d) Plot the drop in water level against time on a graph, and the soakage rate in mm/hr is determined from the minimum slope of the curve. If there is a marked decrease in soakage rate as the hole becomes nearly empty, the lower rates may be discarded and the value closer to the average can be adopted.

9.0.3 The soak pit shall be designed utilising soakage and storage in accordance with 9.0.5 and 9.0.6 to ensure that *surface water* is discharged without overflowing. The rainfall intensity used in the design of the soak pit shall be that of an event having a duration of 1 hour and a 10% probability of occurring annually. Either local rainfall intensity curves produced by the *territorial authority* or rainfall frequency duration information produced by NIWA shall be used to determine the rainfall intensity.

COMMENT:

This Verification Method does not cover the design of soak pits with overflows discharging to *outfalls.* Such soak pits are often provided to retain water until peak flows in the *outfall* have passed and it is normally considered sufficient to design them for an event having a 10 minute duration and a 10% probability of occurring annually.

9.0.4 The soak pit shall comprise either a rock filled hole (see Figure 13 (a)) or a lined chamber (see Figure 13 (b)). Both of these options shall be enclosed in filter cloth

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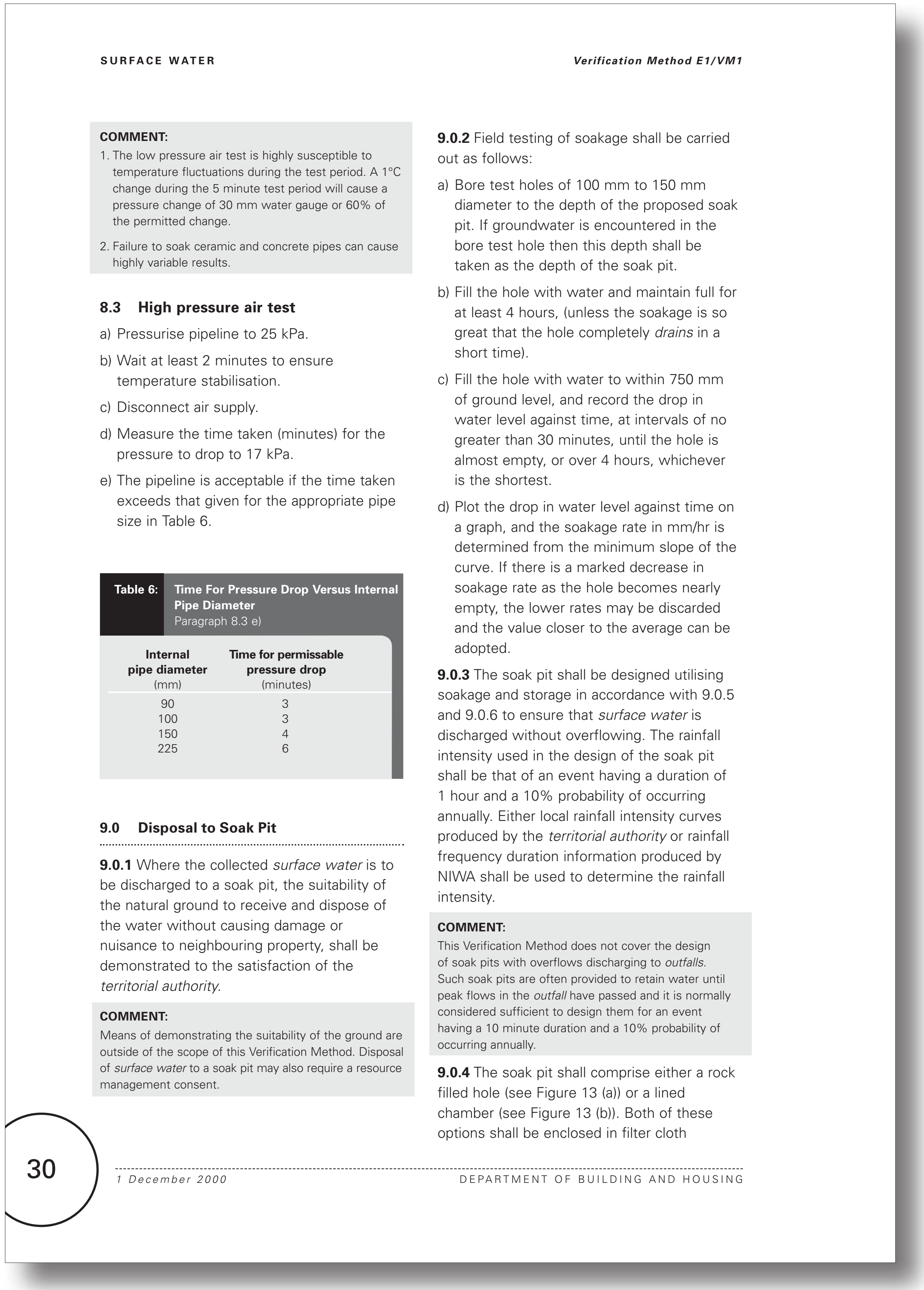
1 December 2000

DEPARTMENT OF BUILDING AND HOUSING

Proposed E1 Surface Water - No changes proposed to this page



SURFACE WATER

Verification Method E1/VM1

COMMENT:

1. The low pressure air test is highly susceptible to temperature fluctuations during the test period. A 1°C change during the 5 minute test period will cause a pressure change of 30 mm water gauge or 60% of the permitted change.
2. Failure to soak ceramic and concrete pipes can cause highly variable results.

8.3 High pressure air test

a) Pressurise pipeline to 25 kPa.

b) Wait at least 2 minutes to ensure temperature stabilisation.

c) Disconnect air supply.

d) Measure the time taken (minutes) for the pressure to drop to 17 kPa.

e) The pipeline is acceptable if the time taken exceeds that given for the appropriate pipe size in Table 6.

Table 6: Time For Pressure Drop Versus Internal Pipe Diameter
Paragraph 8.3 e)

Internal pipe diameter (mm)	Time for permissable pressure drop (minutes)
90	3
100	3
150	4
225	6

9.0 Disposal to Soak Pit

9.0.1 Where the collected *surface water* is to be discharged to a soak pit, the suitability of the natural ground to receive and dispose of the water without causing damage or nuisance to neighbouring property, shall be demonstrated to the satisfaction of the *territorial authority.*

COMMENT:

Means of demonstrating the suitability of the ground are outside of the scope of this Verification Method. Disposal of *surface water* to a soak pit may also require a resource management consent.

9.0.2 Field testing of soakage shall be carried out as follows:

a) Bore test holes of 100 mm to 150 mm diameter to the depth of the proposed soak pit. If groundwater is encountered in the bore test hole then this depth shall be taken as the depth of the soak pit.

b) Fill the hole with water and maintain full for at least 4 hours, (unless the soakage is so great that the hole completely *drains* in a short time).

c) Fill the hole with water to within 750 mm of ground level, and record the drop in water level against time, at intervals of no greater than 30 minutes, until the hole is almost empty, or over 4 hours, whichever is the shortest.

d) Plot the drop in water level against time on a graph, and the soakage rate in mm/hr is determined from the minimum slope of the curve. If there is a marked decrease in soakage rate as the hole becomes nearly empty, the lower rates may be discarded and the value closer to the average can be adopted.

9.0.3 The soak pit shall be designed utilising soakage and storage in accordance with 9.0.5 and 9.0.6 to ensure that *surface water* is discharged without overflowing. The rainfall intensity used in the design of the soak pit shall be that of an event having a duration of 1 hour and a 10% probability of occurring annually. Either local rainfall intensity curves produced by the *territorial authority* or rainfall frequency duration information produced by NIWA shall be used to determine the rainfall intensity.

COMMENT:

This Verification Method does not cover the design of soak pits with overflows discharging to *outfalls.* Such soak pits are often provided to retain water until peak flows in the *outfall* have passed and it is normally considered sufficient to design them for an event having a 10 minute duration and a 10% probability of occurring annually.

9.0.4 The soak pit shall comprise either a rock filled hole (see Figure 13 (a)) or a lined chamber (see Figure 13 (b)). Both of these options shall be enclosed in filter cloth

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1 December 2000

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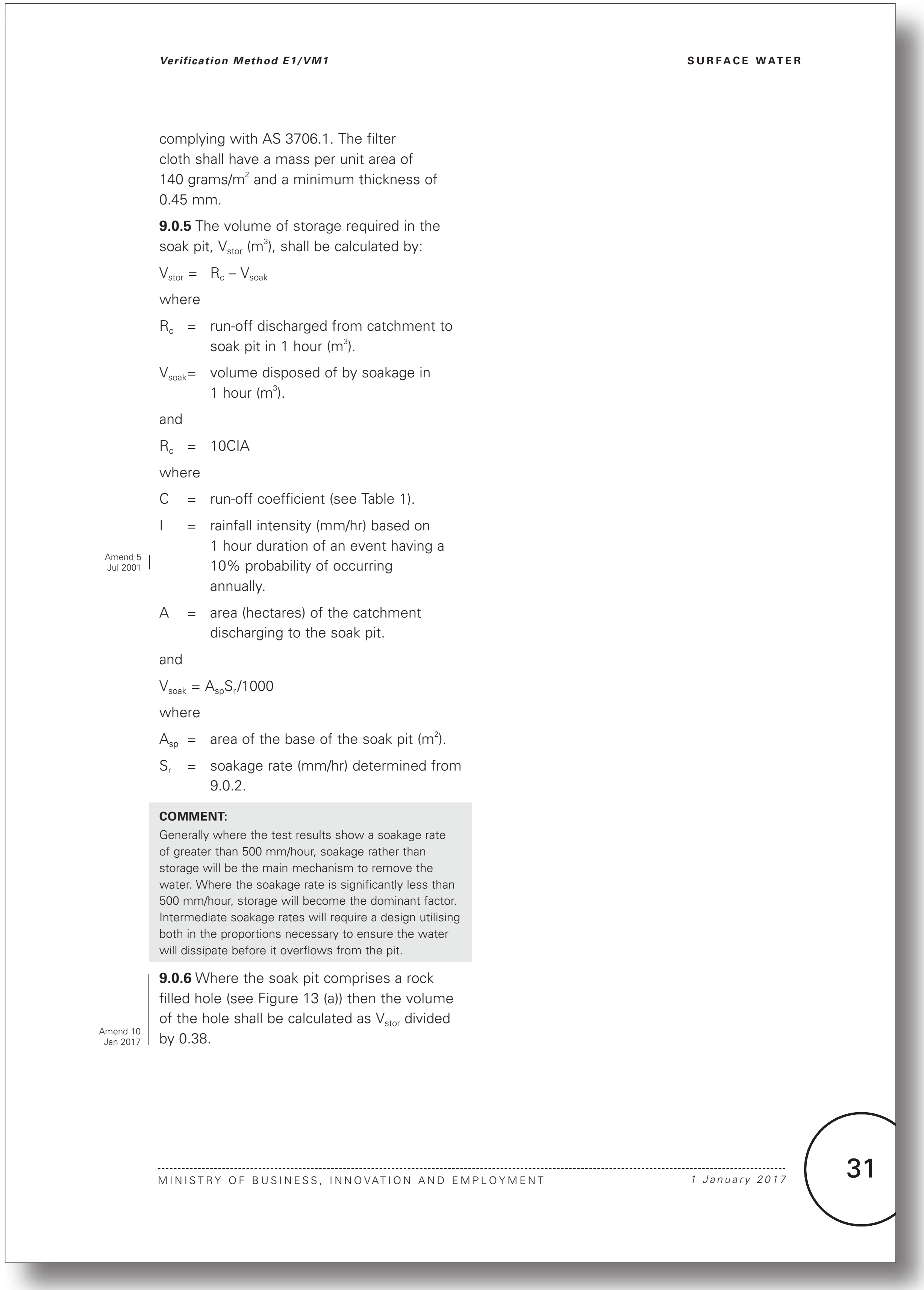
Current E1 Surface Water - No changes proposed to this page



complying with AS 3706.1. The filter cloth shall have a mass per unit area of 140 grams/m^2 and a minimum thickness of 0.45 mm.

9.0.5 The volume of storage required in the soak pit, V_{stor} (m^3), shall be calculated by:

$V_{stor} = R_c - V_{soak}$

where

R_c = run-off discharged from catchment to soak pit in 1 hour (m^3).

V_{soak} = volume disposed of by soakage in 1 hour (m^3).

and

R_c = 10CIA

where

C = run-off coefficient (see Table 1).

I = rainfall intensity (mm/hr) based on 1 hour duration of an event having a 10% probability of occurring annually.

Amend 5 Jul 2001

A = area (hectares) of the catchment discharging to the soak pit.

and

$V_{soak} = A_{sp}S_r/1000$

where

A_{sp} = area of the base of the soak pit (m^2).

S_r = soakage rate (mm/hr) determined from 9.0.2.

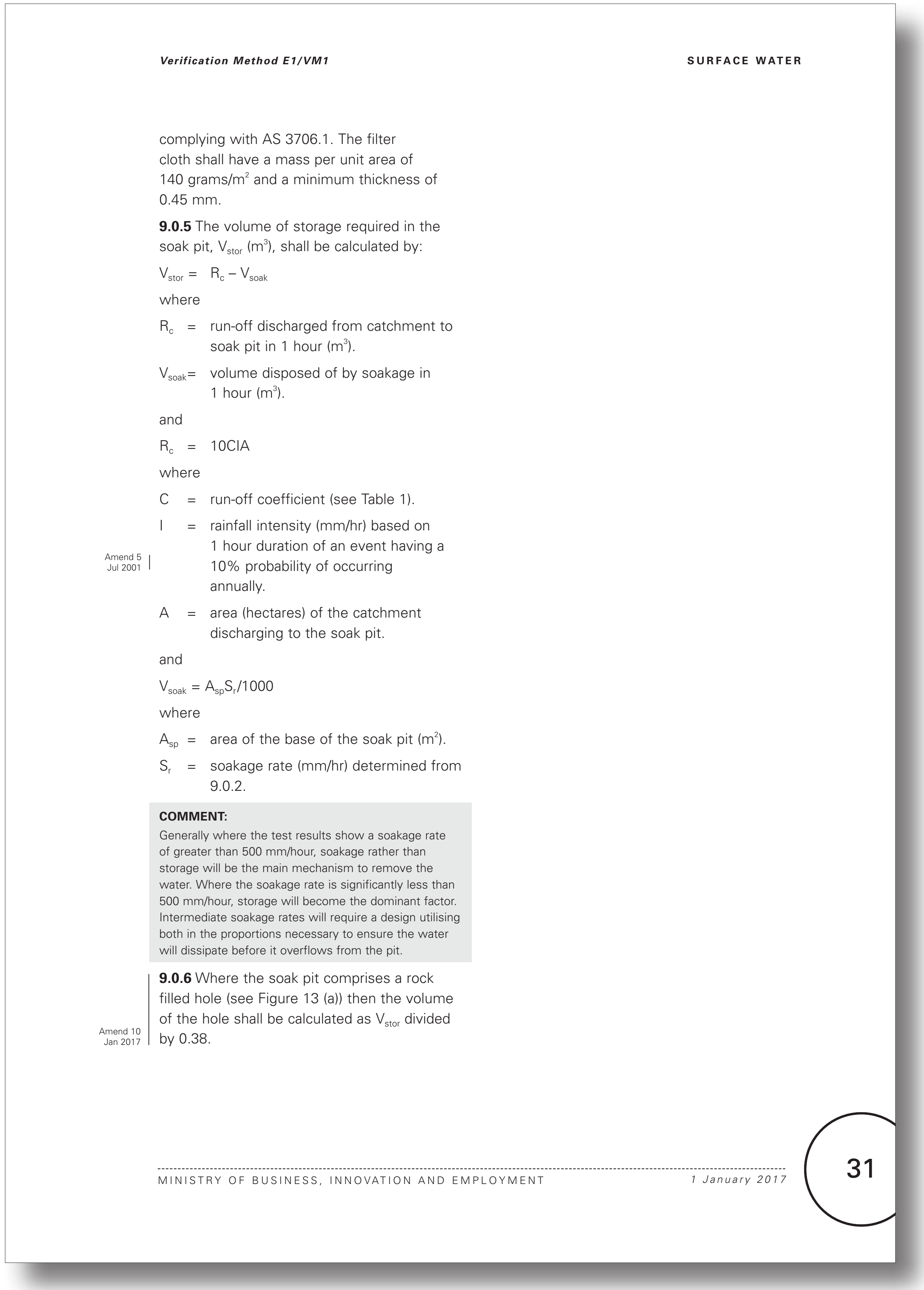
COMMENT:

Generally where the test results show a soakage rate of greater than 500 mm/hour, soakage rather than storage will be the main mechanism to remove the water. Where the soakage rate is significantly less than 500 mm/hour, storage will become the dominant factor. Intermediate soakage rates will require a design utilising both in the proportions necessary to ensure the water will dissipate before it overflows from the pit.

9.0.6 Where the soak pit comprises a rock filled hole (see Figure 13 (a)) then the volume of the hole shall be calculated as V_{stor} divided by 0.38.

Amend 10 Jan 2017

Proposed E1 Surface Water - No changes proposed to this page



Verification Method E1/VM1 SURFACE WATER

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and

R_c = 10CIA

where

C = run-off coefficient (see Table 1).

I = rainfall intensity (mm/hr) based on 1 hour duration of an event having a 10% probability of occurring annually.

Amend 5 Jul 2001

A = area (hectares) of the catchment discharging to the soak pit.

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$V_{soak} = A_{sp}S_r/1000$

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Amend 10 Jan 2017

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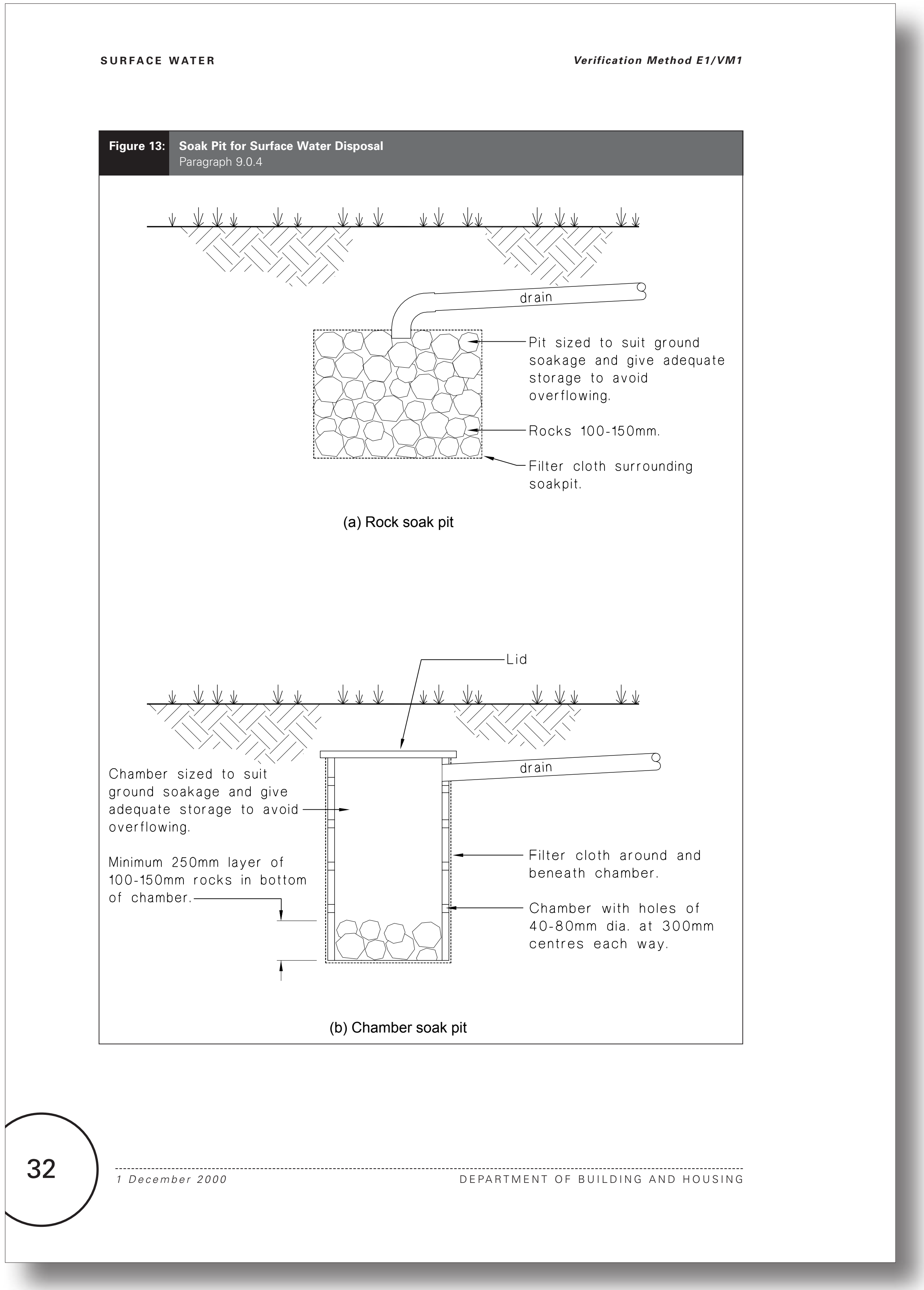
Current E1 Surface Water - No changes proposed to this page



SURFACE WATER

Verification Method E1/VM1

Figure 13: **Soak Pit for Surface Water Disposal**
Paragraph 9.0.4

(a) Rock soak pit

(b) Chamber soak pit

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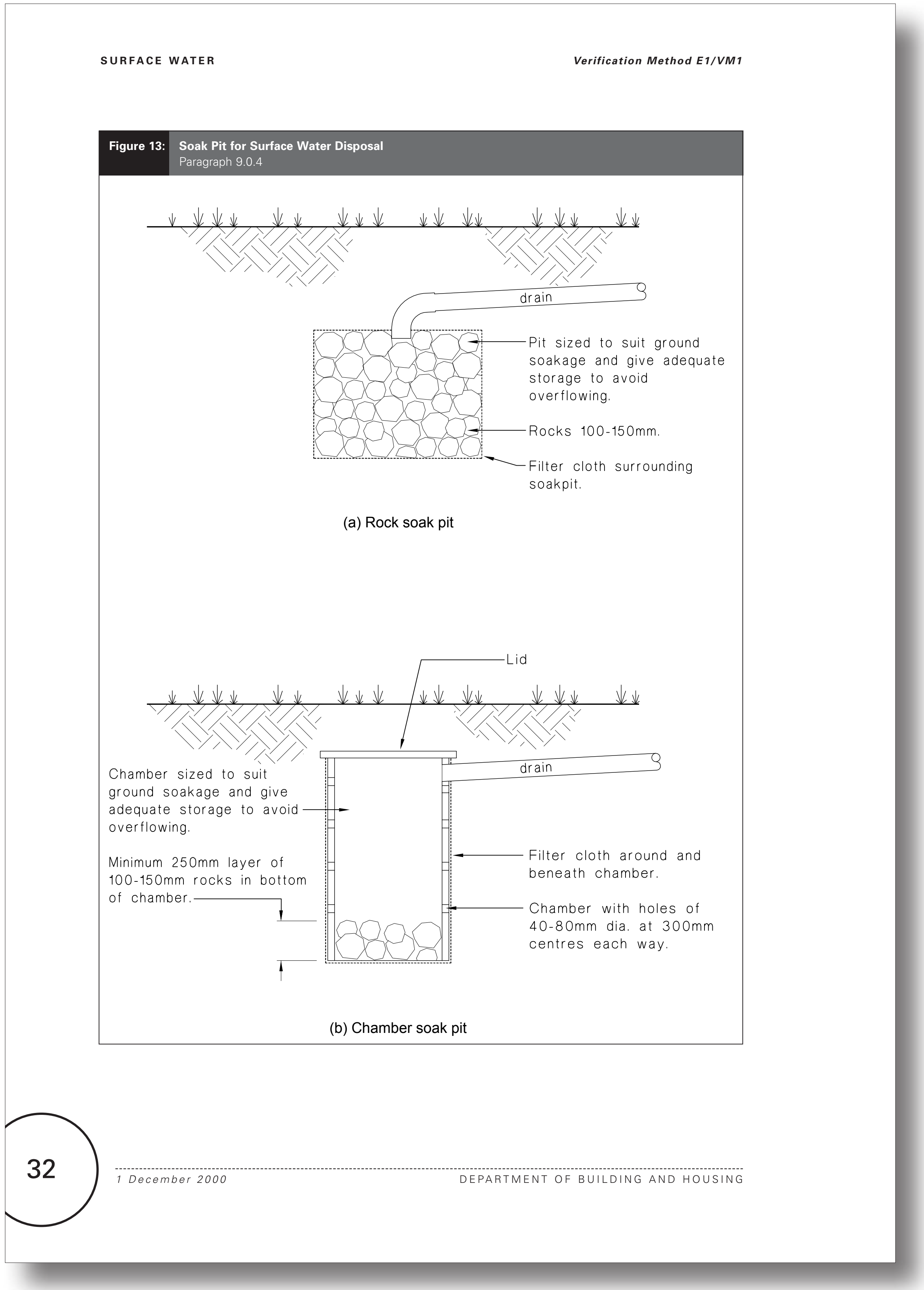
1 December 2000

DEPARTMENT OF BUILDING AND HOUSING

Proposed E1 Surface Water - No changes proposed to this page



SURFACE WATER

Verification Method E1/VM1

Figure 13: **Soak Pit for Surface Water Disposal**
Paragraph 9.0.4

(a) Rock soak pit

(b) Chamber soak pit

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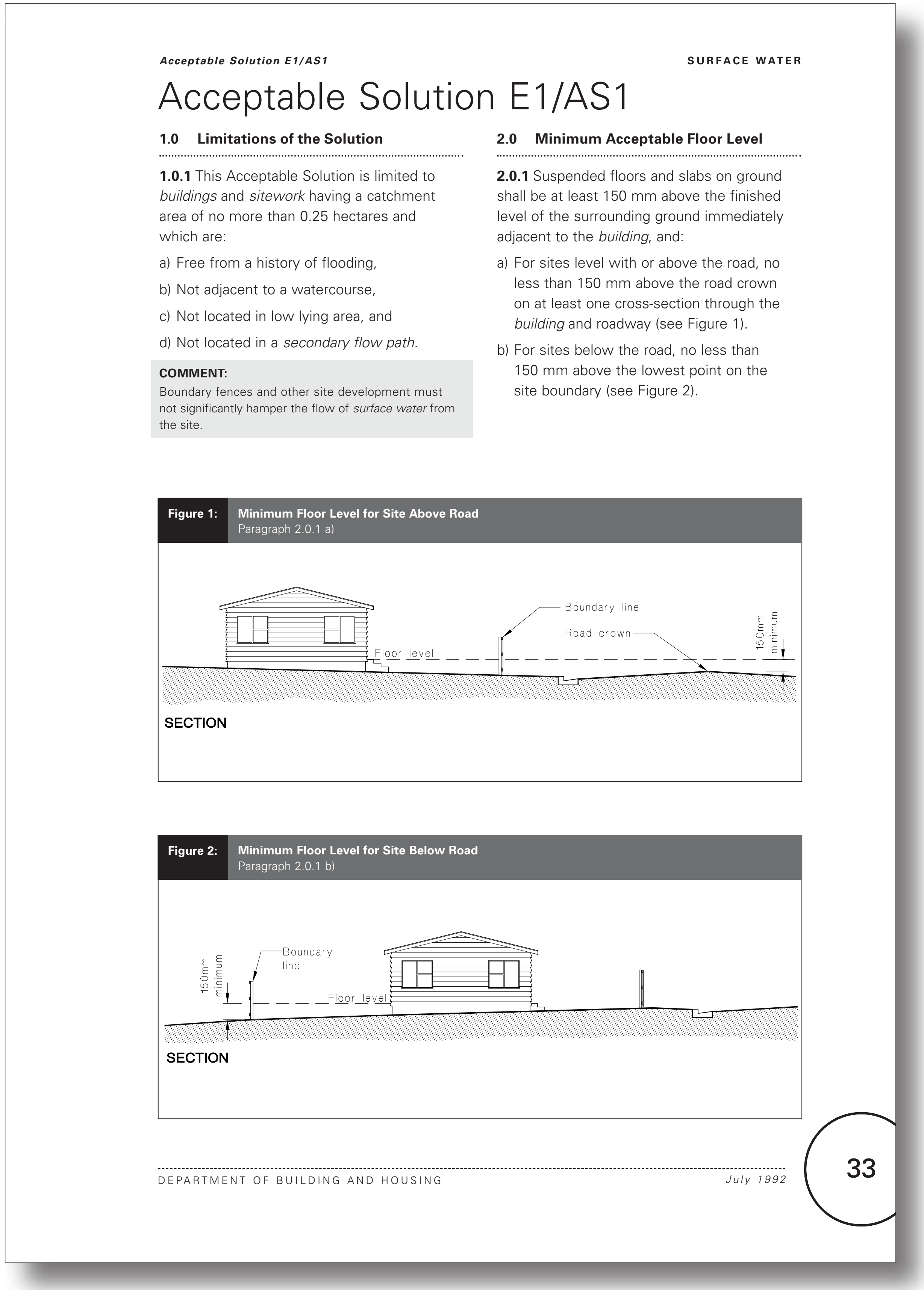
1 December 2000

DEPARTMENT OF BUILDING AND HOUSING

Current E1 Surface Water - No changes proposed to this page



Acceptable Solution E1/AS1

1.0 Limitations of the Solution

1.0.1 This Acceptable Solution is limited to *buildings* and *sitework* having a catchment area of no more than 0.25 hectares and which are:

a) Free from a history of flooding,

b) Not adjacent to a watercourse,

c) Not located in low lying area, and

d) Not located in a *secondary flow path.*

COMMENT:
Boundary fences and other site development must not significantly hamper the flow of *surface water* from the site.

2.0 Minimum Acceptable Floor Level

2.0.1 Suspended floors and slabs on ground shall be at least 150 mm above the finished level of the surrounding ground immediately adjacent to the *building*, and:

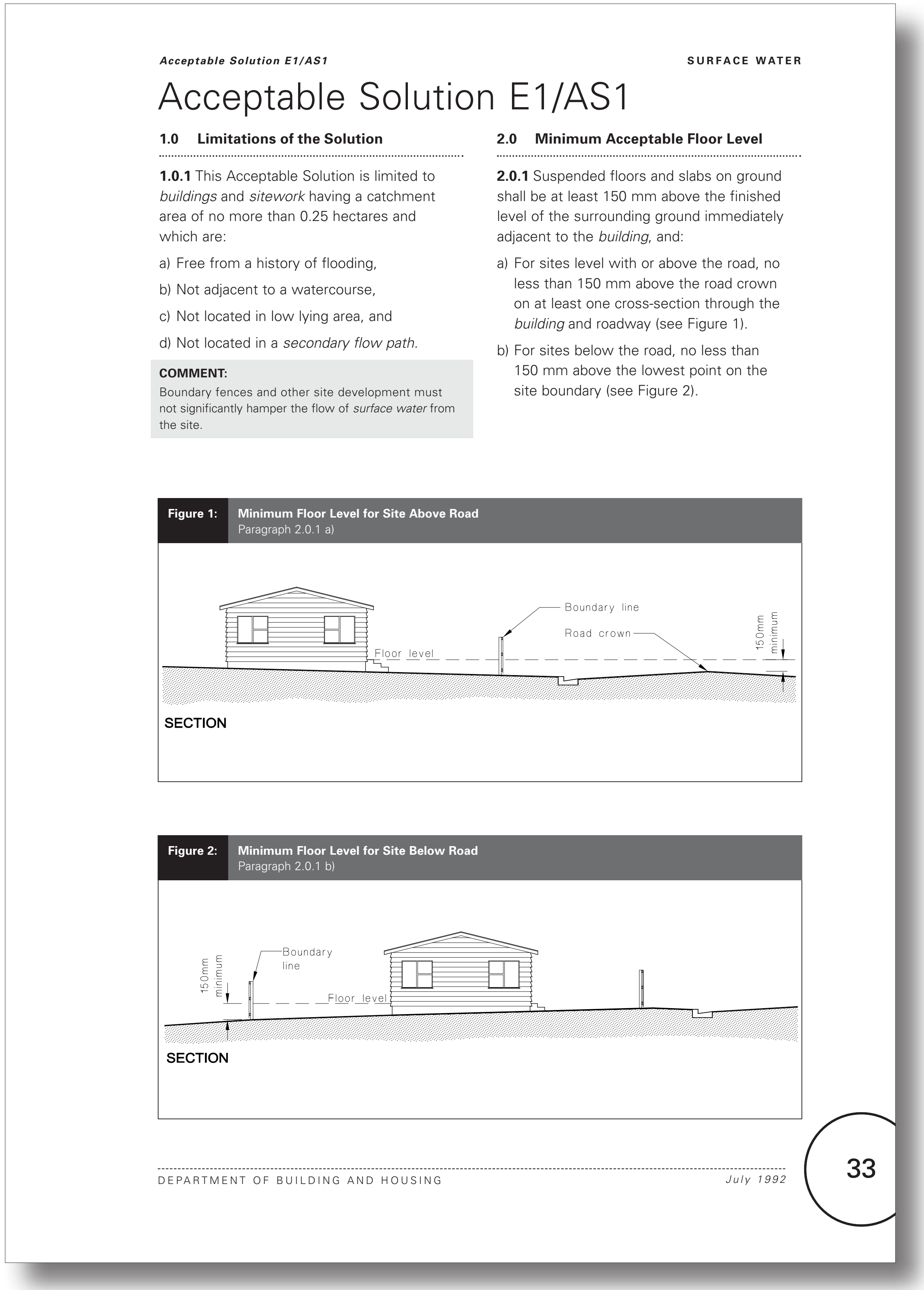
a) For sites level with or above the road, no less than 150 mm above the road crown on at least one cross-section through the *building* and roadway (see Figure 1).

b) For sites below the road, no less than 150 mm above the lowest point on the site boundary (see Figure 2).

Figure 1: **Minimum Floor Level for Site Above Road**
Paragraph 2.0.1 a)

Figure 2: **Minimum Floor Level for Site Below Road**
Paragraph 2.0.1 b)

Proposed E1 Surface Water - No changes proposed to this page



Acceptable Solution E1/AS1 SURFACE WATER

Acceptable Solution E1/AS1

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b) Not adjacent to a watercourse,

c) Not located in low lying area, and

d) Not located in a *secondary flow path.*

COMMENT:
Boundary fences and other site development must not significantly hamper the flow of *surface water* from the site.

2.0 Minimum Acceptable Floor Level

2.0.1 Suspended floors and slabs on ground shall be at least 150 mm above the finished level of the surrounding ground immediately adjacent to the *building*, and:

a) For sites level with or above the road, no less than 150 mm above the road crown on at least one cross-section through the *building* and roadway (see Figure 1).

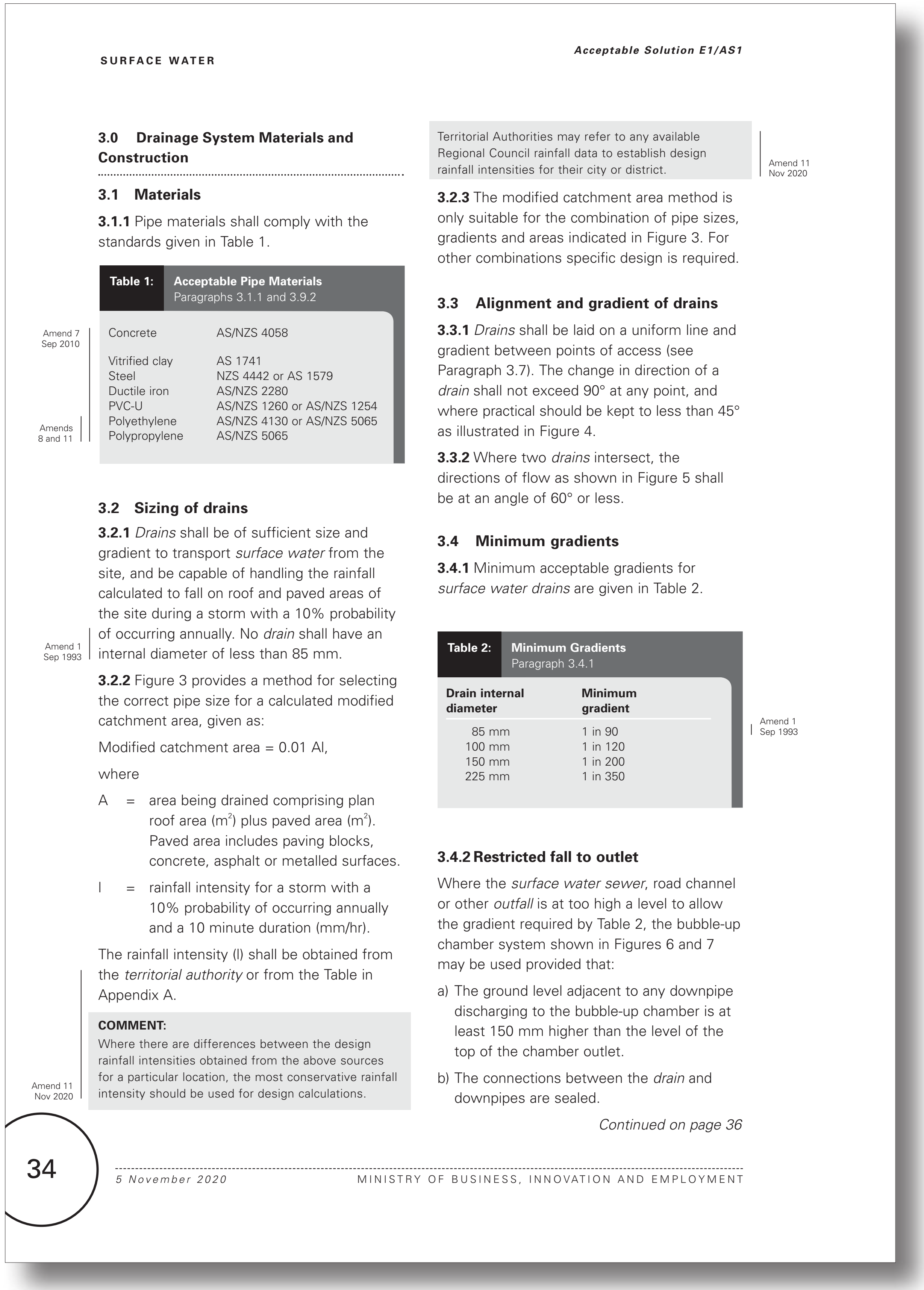
b) For sites below the road, no less than 150 mm above the lowest point on the site boundary (see Figure 2).

Figure 1: **Minimum Floor Level for Site Above Road**
Paragraph 2.0.1 a)

Figure 2: **Minimum Floor Level for Site Below Road**
Paragraph 2.0.1 b)

DEPARTMENT OF BUILDING AND HOUSING *July 1992* 33

Current E1 Surface Water - No changes proposed to this page



3.0 Drainage System Materials and Construction

3.1 Materials

3.1.1 Pipe materials shall comply with the standards given in Table 1.

Table 1: Acceptable Pipe Materials
Paragraphs 3.1.1 and 3.9.2

Concrete	AS/NZS 4058
Vitrified clay	AS 1741
Steel	NZS 4442 or AS 1579
Ductile iron	AS/NZS 2280
PVC-U	AS/NZS 1260 or AS/NZS 1254
Polyethylene	AS/NZS 4130 or AS/NZS 5065
Polypropylene	AS/NZS 5065

Amend 7 Sep 2010

Amends 8 and 11

3.2 Sizing of drains

3.2.1 *Drains* shall be of sufficient size and gradient to transport *surface water* from the site, and be capable of handling the rainfall calculated to fall on roof and paved areas of the site during a storm with a 10% probability of occurring annually. No *drain* shall have an internal diameter of less than 85 mm.

Amend 1 Sep 1993

3.2.2 Figure 3 provides a method for selecting the correct pipe size for a calculated modified catchment area, given as:

Modified catchment area = 0.01 AI,

where

A = area being drained comprising plan roof area (m^2) plus paved area (m^2). Paved area includes paving blocks, concrete, asphalt or metalled surfaces.

I = rainfall intensity for a storm with a 10% probability of occurring annually and a 10 minute duration (mm/hr).

The rainfall intensity (I) shall be obtained from the *territorial authority* or from the Table in Appendix A.

COMMENT:
Where there are differences between the design rainfall intensities obtained from the above sources for a particular location, the most conservative rainfall intensity should be used for design calculations.

Territorial Authorities may refer to any available Regional Council rainfall data to establish design rainfall intensities for their city or district.

Amend 11 Nov 2020

3.2.3 The modified catchment area method is only suitable for the combination of pipe sizes, gradients and areas indicated in Figure 3. For other combinations specific design is required.

3.3 Alignment and gradient of drains

3.3.1 *Drains* shall be laid on a uniform line and gradient between points of access (see Paragraph 3.7). The change in direction of a *drain* shall not exceed 90° at any point, and where practical should be kept to less than 45° as illustrated in Figure 4.

3.3.2 Where two *drains* intersect, the directions of flow as shown in Figure 5 shall be at an angle of 60° or less.

3.4 Minimum gradients

3.4.1 Minimum acceptable gradients for *surface water drains* are given in Table 2.

Table 2: Minimum Gradients
Paragraph 3.4.1

Drain internal diameter	Minimum gradient
85 mm	1 in 90
100 mm	1 in 120
150 mm	1 in 200
225 mm	1 in 350

Amend 1 Sep 1993

3.4.2 Restricted fall to outlet

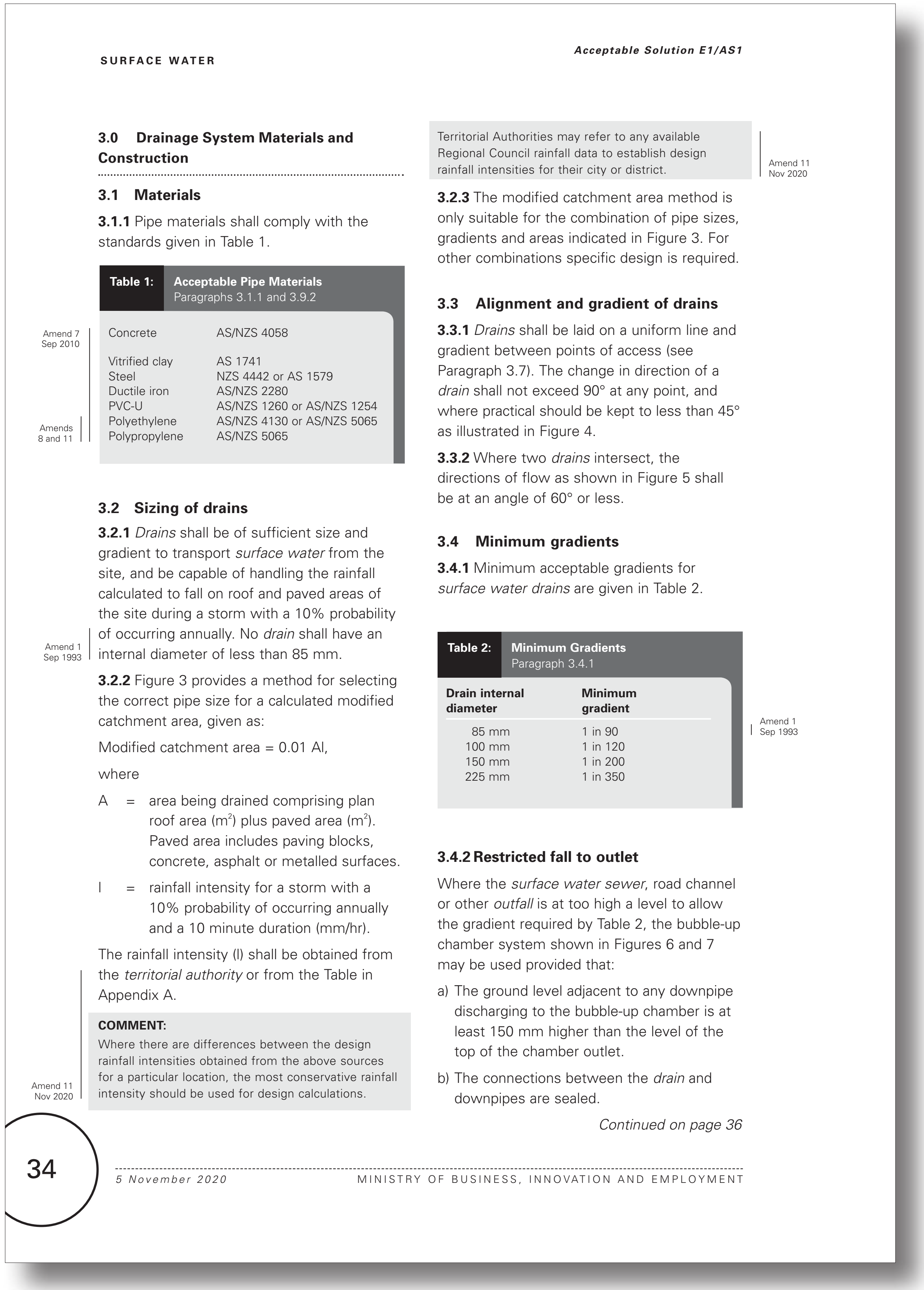
Where the *surface water sewer*, road channel or other *outfall* is at too high a level to allow the gradient required by Table 2, the bubble-up chamber system shown in Figures 6 and 7 may be used provided that:

a) The ground level adjacent to any downpipe discharging to the bubble-up chamber is at least 150 mm higher than the level of the top of the chamber outlet.

b) The connections between the *drain* and downpipes are sealed.

Continued on page 36

Proposed E1 Surface Water - No changes proposed to this page



SURFACE WATER

Acceptable Solution E1/AS1

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Polyethylene AS/NZS 4130 or AS/NZS 5065
Polypropylene AS/NZS 5065

Amend 7 Sep 2010

Amends 8 and 11

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Amend 1 Sep 1993

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The rainfall intensity (I) shall be obtained from the *territorial authority* or from the Table in Appendix A.

COMMENT:
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Amend 11 Nov 2020

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3.3.2 Where two *drains* intersect, the directions of flow as shown in Figure 5 shall be at an angle of 60° or less.

3.4 Minimum gradients

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Table 2: Minimum Gradients
Paragraph 3.4.1

Drain internal diameter / Minimum gradient
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Amend 1 Sep 1993

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a) The ground level adjacent to any downpipe discharging to the bubble-up chamber is at least 150 mm higher than the level of the top of the chamber outlet.

b) The connections between the *drain* and downpipes are sealed.

Continued on page 36

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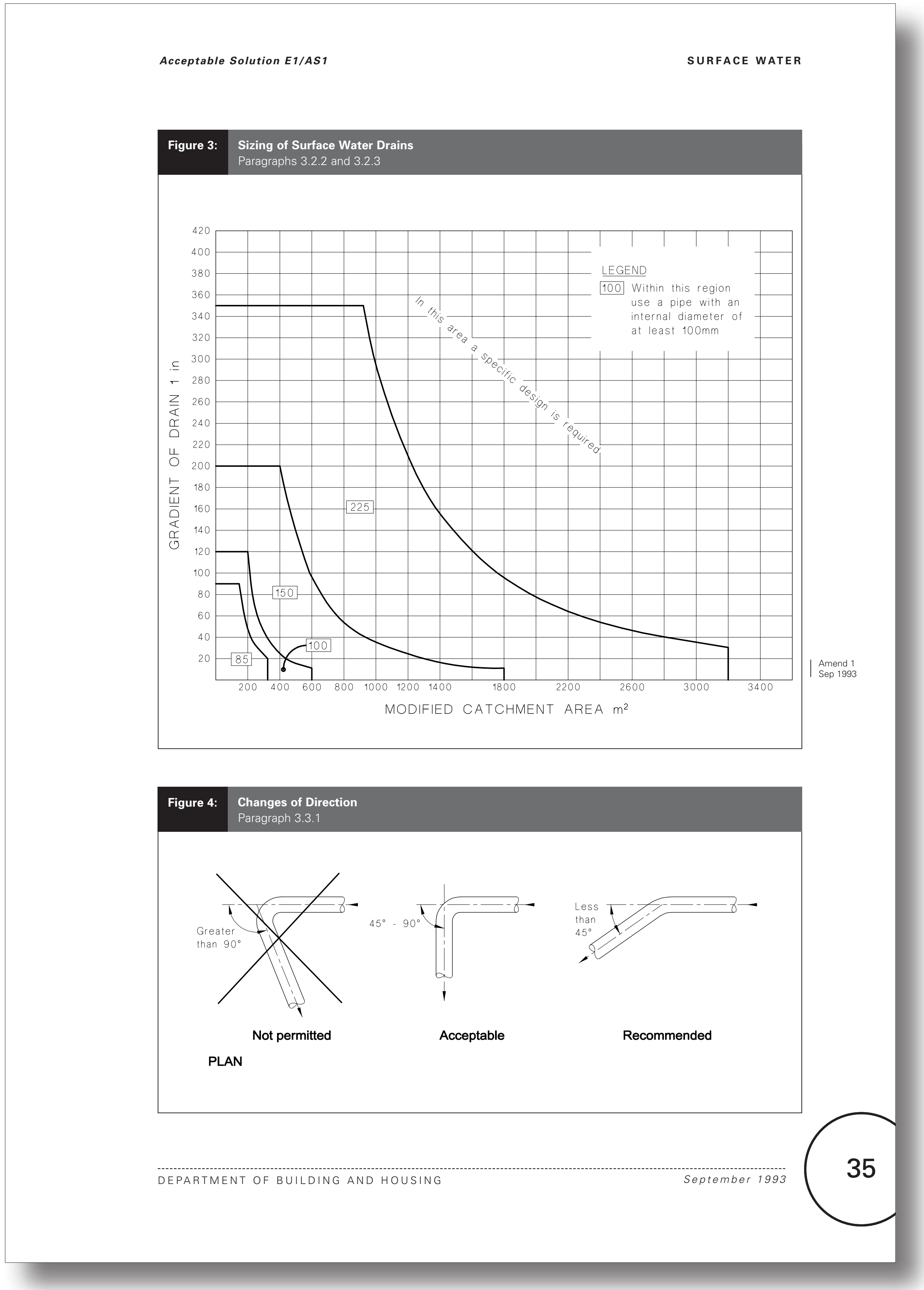
Current E1 Surface Water - No changes proposed to this page



Acceptable Solution E1/AS1 SURFACE WATER

Figure 3: **Sizing of Surface Water Drains**
Paragraphs 3.2.2 and 3.2.3

Amend 1
Sep 1993

Figure 4: **Changes of Direction**
Paragraph 3.3.1

DEPARTMENT OF BUILDING AND HOUSING *September 1993*

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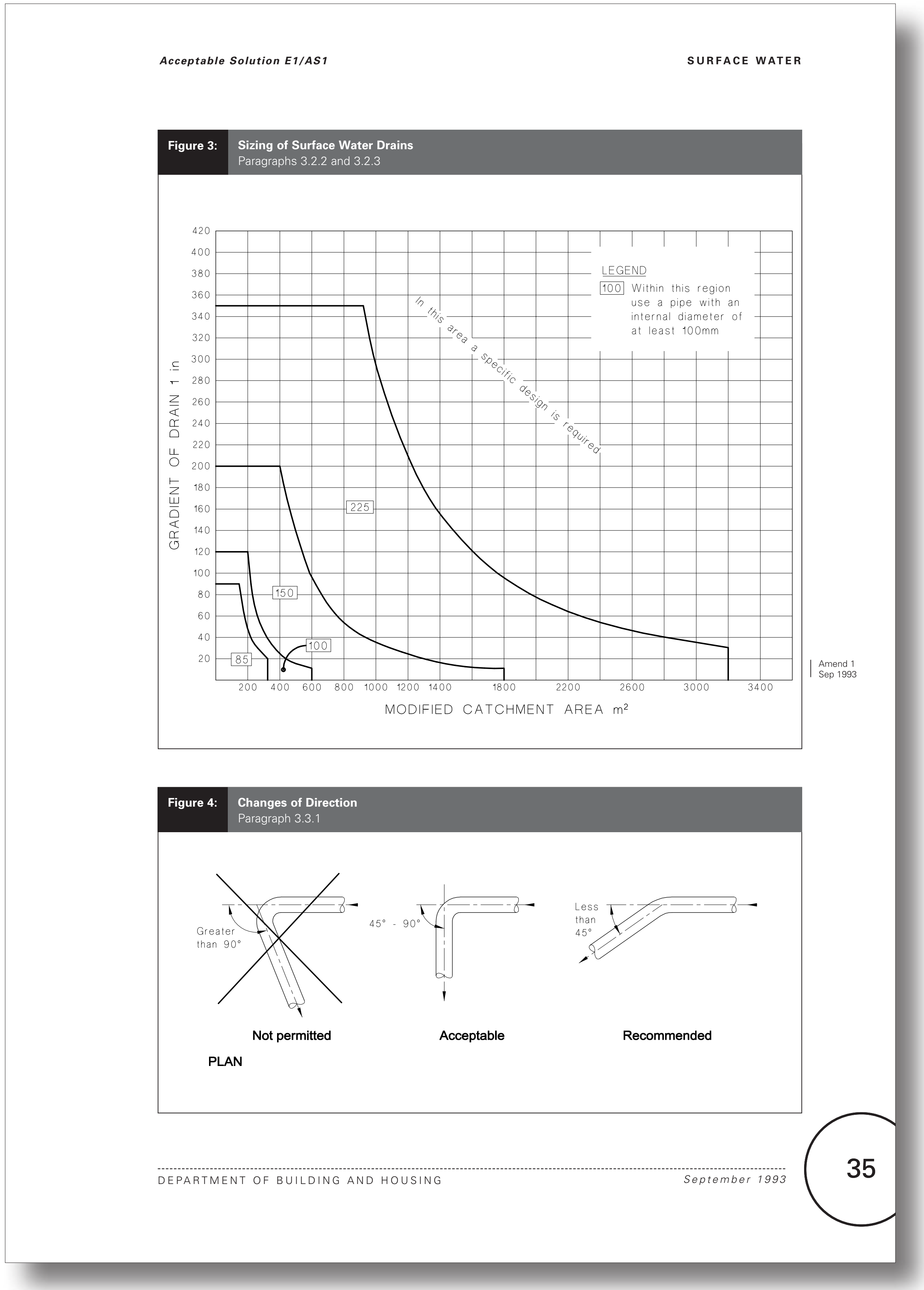
Proposed E1 Surface Water - No changes proposed to this page



Acceptable Solution E1/AS1 SURFACE WATER

Figure 3: **Sizing of Surface Water Drains**
Paragraphs 3.2.2 and 3.2.3

Amend 1
Sep 1993

Figure 4: **Changes of Direction**
Paragraph 3.3.1

DEPARTMENT OF BUILDING AND HOUSING *September 1993*

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Current E1 Surface Water - No changes proposed to this page

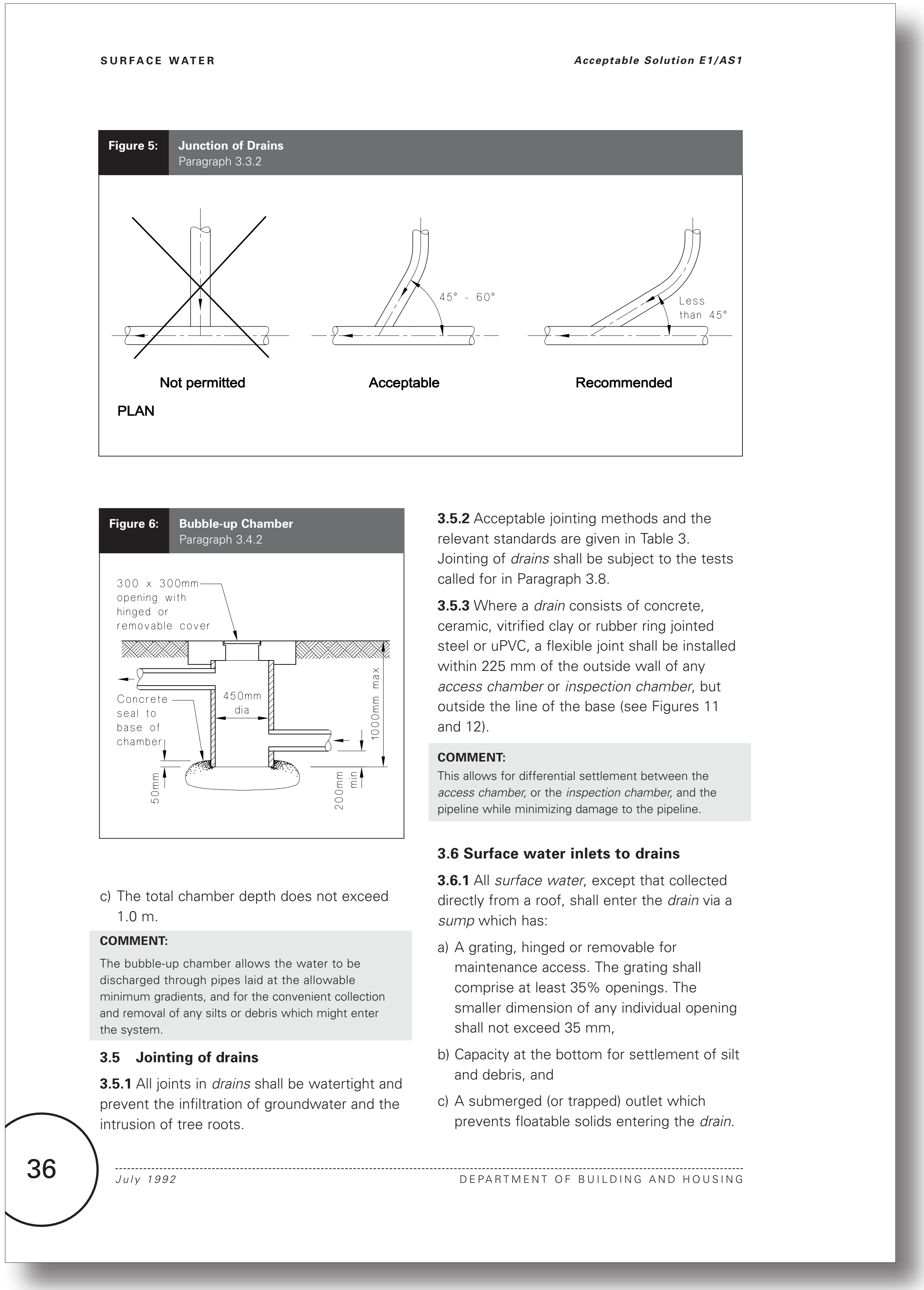


Figure 5: **Junction of Drains**
Paragraph 3.3.2

Figure 6: **Bubble-up Chamber**
Paragraph 3.4.2

c) The total chamber depth does not exceed 1.0 m.

COMMENT:

The bubble-up chamber allows the water to be discharged through pipes laid at the allowable minimum gradients, and for the convenient collection and removal of any silts or debris which might enter the system.

3.5 Jointing of drains

3.5.1 All joints in *drains* shall be watertight and prevent the infiltration of groundwater and the intrusion of tree roots.

3.5.2 Acceptable jointing methods and the relevant standards are given in Table 3. Jointing of *drains* shall be subject to the tests called for in Paragraph 3.8.

3.5.3 Where a *drain* consists of concrete, ceramic, vitrified clay or rubber ring jointed steel or uPVC, a flexible joint shall be installed within 225 mm of the outside wall of any *access chamber* or *inspection chamber*, but outside the line of the base (see Figures 11 and 12).

COMMENT:

This allows for differential settlement between the *access chamber*, or the *inspection chamber*, and the pipeline while minimizing damage to the pipeline.

3.6 Surface water inlets to drains

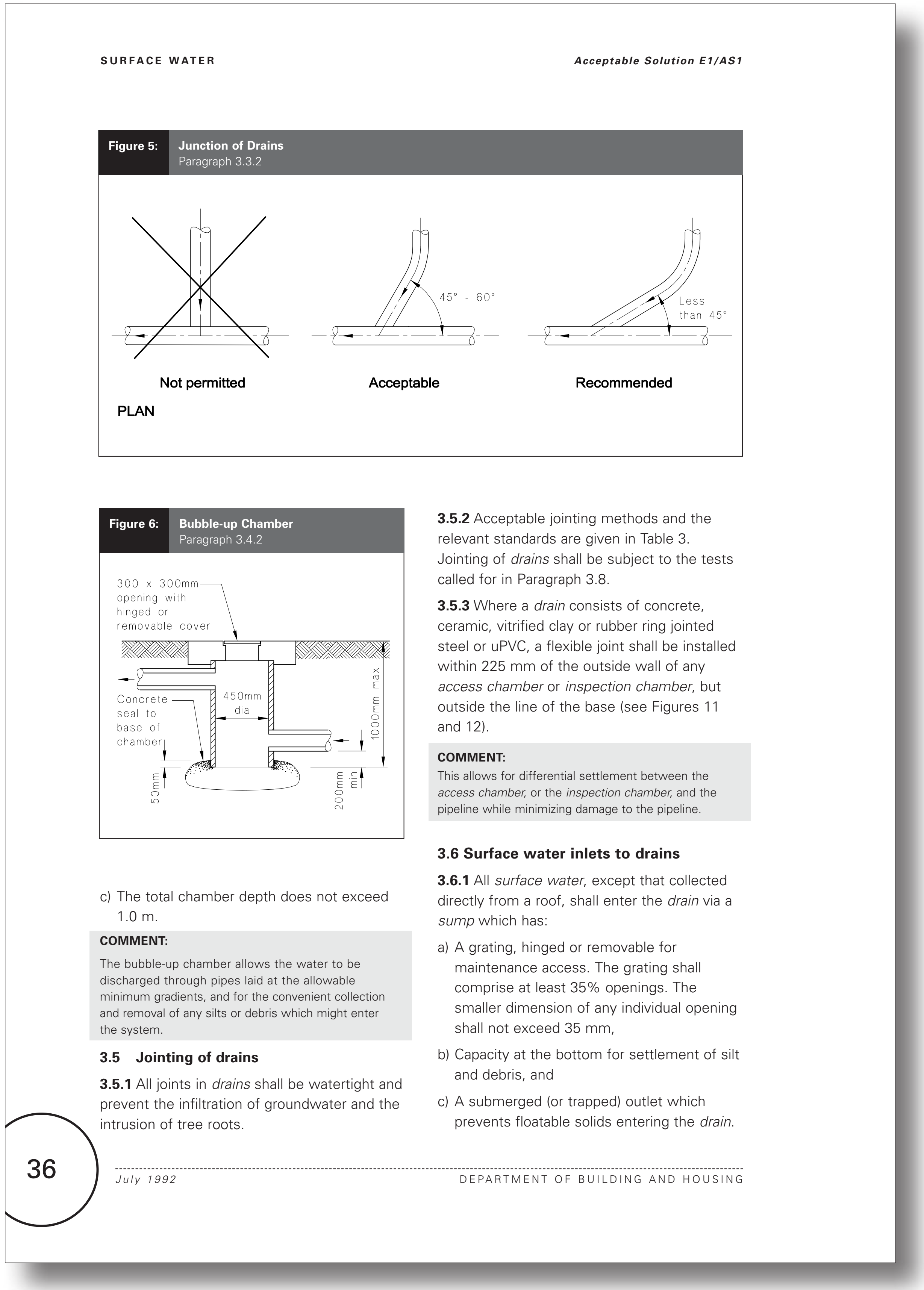
3.6.1 All *surface water*, except that collected directly from a roof, shall enter the *drain* via a *sump* which has:

a) A grating, hinged or removable for maintenance access. The grating shall comprise at least 35% openings. The smaller dimension of any individual opening shall not exceed 35 mm,

b) Capacity at the bottom for settlement of silt and debris, and

c) A submerged (or trapped) outlet which prevents floatable solids entering the *drain*.

Proposed E1 Surface Water - No changes proposed to this page



SURFACE WATER Acceptable Solution E1/AS1

Figure 5: **Junction of Drains**
Paragraph 3.3.2

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c) A submerged (or trapped) outlet which prevents floatable solids entering the *drain*.

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Appendix A. Proposed changes to the acceptable solutions and verification methods for clause E1 Surface Water

Current E1 Surface Water acceptable solutions and verification methods

(Text to be amended shown in red)

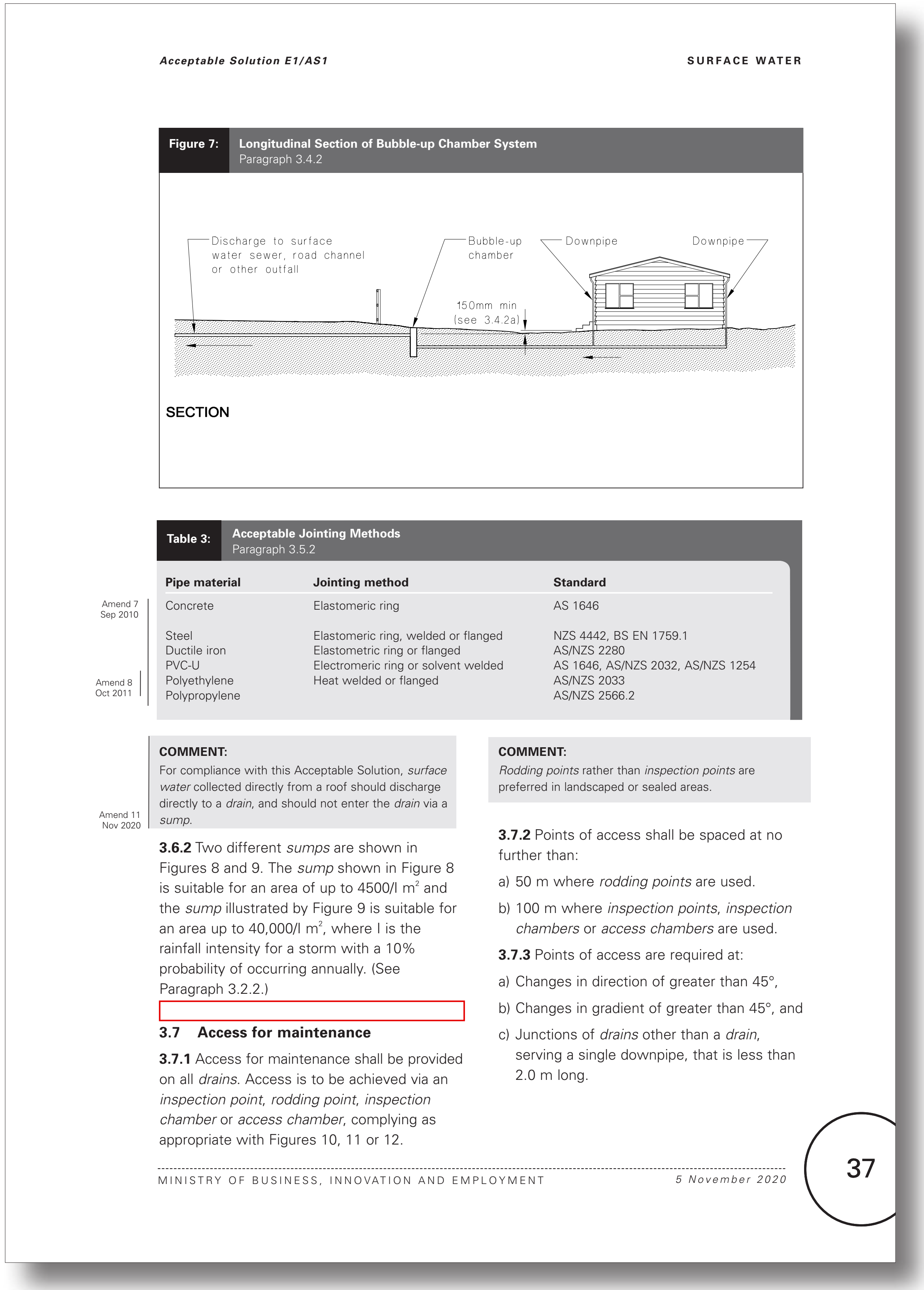

Figure 7: **Longitudinal Section of Bubble-up Chamber System**
Paragraph 3.4.2

Table 3: **Acceptable Jointing Methods**
Paragraph 3.5.2

Pipe material	**Jointing method**	**Standard**
Concrete	Elastomeric ring	AS 1646
Steel	Elastomeric ring, welded or flanged	NZS 4442, BS EN 1759.1
Ductile iron	Elastometric ring or flanged	AS/NZS 2280
PVC-U	Electromeric ring or solvent welded	AS 1646, AS/NZS 2032, AS/NZS 1254
Polyethylene	Heat welded or flanged	AS/NZS 2033
Polypropylene		AS/NZS 2566.2

Amend 7 Sep 2010

Amend 8 Oct 2011

COMMENT:

For compliance with this Acceptable Solution, *surface water* collected directly from a roof should discharge directly to a *drain*, and should not enter the *drain* via a *sump*.

Amend 11 Nov 2020

3.6.2 Two different *sumps* are shown in Figures 8 and 9. The *sump* shown in Figure 8 is suitable for an area of up to 4500/I m^2 and the *sump* illustrated by Figure 9 is suitable for an area up to 40,000/I m^2, where I is the rainfall intensity for a storm with a 10% probability of occurring annually. (See Paragraph 3.2.2.)

3.7 Access for maintenance

3.7.1 Access for maintenance shall be provided on all *drains.* Access is to be achieved via an *inspection point, rodding point, inspection chamber* or *access chamber*, complying as appropriate with Figures 10, 11 or 12.

COMMENT:

Rodding points rather than *inspection points* are preferred in landscaped or sealed areas.

3.7.2 Points of access shall be spaced at no further than:

a) 50 m where *rodding points* are used.

b) 100 m where *inspection points, inspection chambers* or *access chambers* are used.

3.7.3 Points of access are required at:

a) Changes in direction of greater than 45°,

b) Changes in gradient of greater than 45°, and

c) Junctions of *drains* other than a *drain*, serving a single downpipe, that is less than 2.0 m long.

Proposed amendments to E1 Surface Water acceptable solutions and verification methods

(Proposed text in blue)

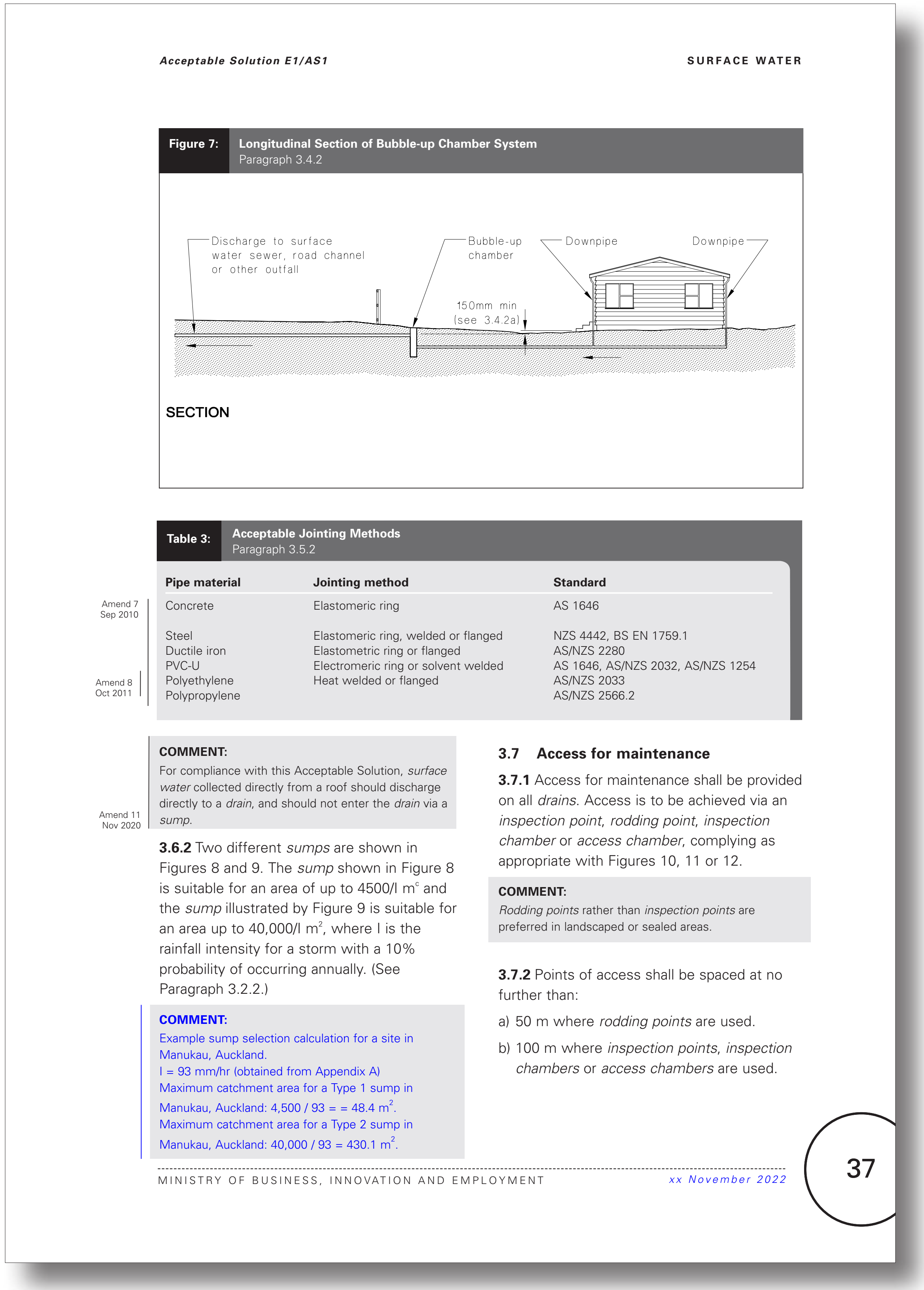

Figure 7: **Longitudinal Section of Bubble-up Chamber System**
Paragraph 3.4.2

Table 3: **Acceptable Jointing Methods**
Paragraph 3.5.2

Pipe material	**Jointing method**	**Standard**
Concrete	Elastomeric ring	AS 1646
Steel	Elastomeric ring, welded or flanged	NZS 4442, BS EN 1759.1
Ductile iron	Elastometric ring or flanged	AS/NZS 2280
PVC-U	Electromeric ring or solvent welded	AS 1646, AS/NZS 2032, AS/NZS 1254
Polyethylene	Heat welded or flanged	AS/NZS 2033
Polypropylene		AS/NZS 2566.2

Amend 7 Sep 2010

Amend 8 Oct 2011

COMMENT:

For compliance with this Acceptable Solution, *surface water* collected directly from a roof should discharge directly to a *drain*, and should not enter the *drain* via a *sump*.

Amend 11 Nov 2020

3.6.2 Two different *sumps* are shown in Figures 8 and 9. The *sump* shown in Figure 8 is suitable for an area of up to 4500/I m^2 and the *sump* illustrated by Figure 9 is suitable for an area up to 40,000/I m^2, where I is the rainfall intensity for a storm with a 10% probability of occurring annually. (See Paragraph 3.2.2.)

COMMENT:

Example sump selection calculation for a site in Manukau, Auckland.
I = 93 mm/hr (obtained from Appendix A)
Maximum catchment area for a Type 1 sump in Manukau, Auckland: 4,500 / 93 = = 48.4 m^2.
Maximum catchment area for a Type 2 sump in Manukau, Auckland: 40,000 / 93 = 430.1 m^2.

3.7 Access for maintenance

3.7.1 Access for maintenance shall be provided on all *drains.* Access is to be achieved via an *inspection point, rodding point, inspection chamber* or *access chamber*, complying as appropriate with Figures 10, 11 or 12.

COMMENT:

Rodding points rather than *inspection points* are preferred in landscaped or sealed areas.

3.7.2 Points of access shall be spaced at no further than:

a) 50 m where *rodding points* are used.

b) 100 m where *inspection points, inspection chambers* or *access chambers* are used.

Current E1 Surface Water - No changes proposed to this page

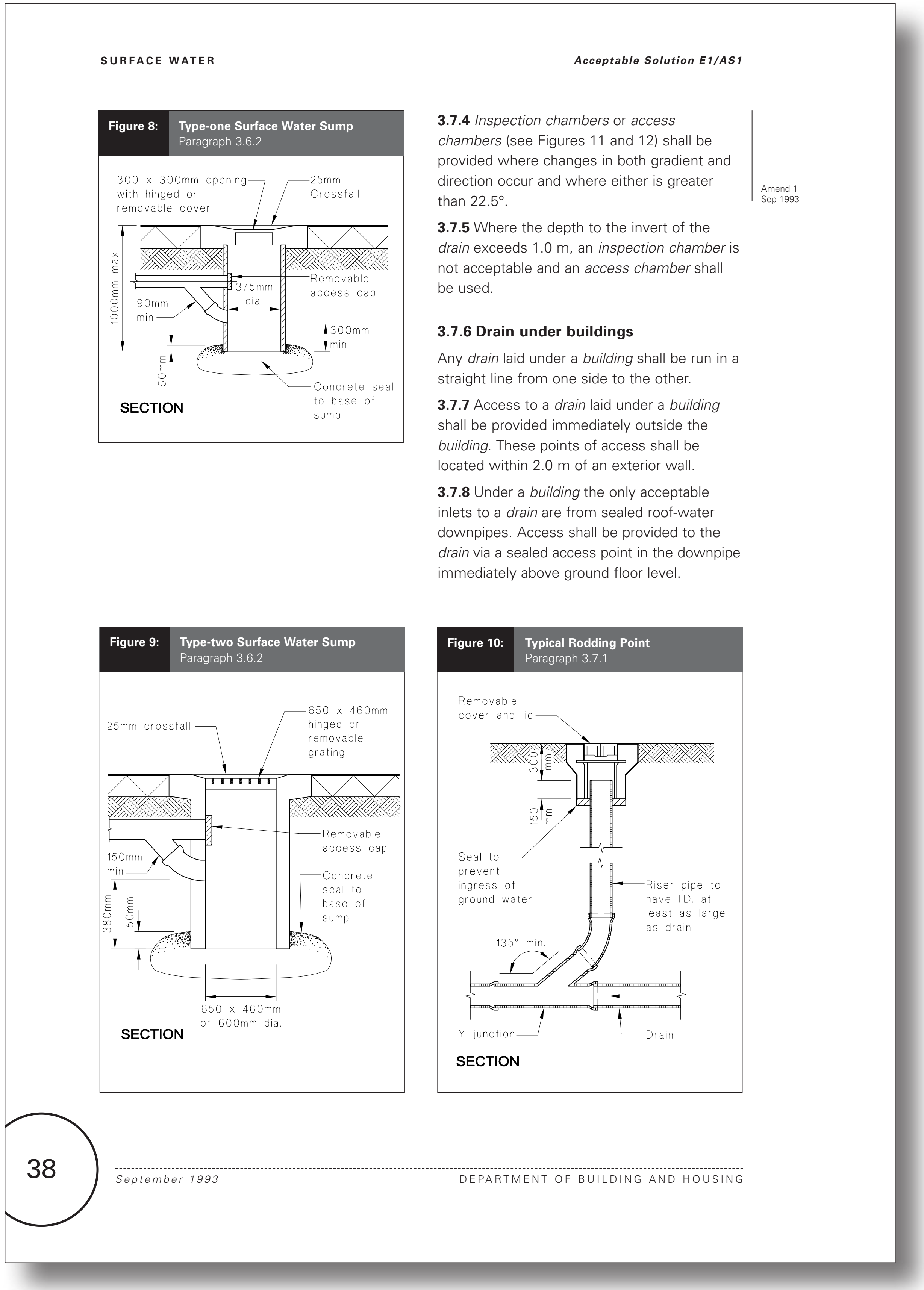

Figure 8: **Type-one Surface Water Sump**
Paragraph 3.6.2

3.7.4 *Inspection chambers* or *access chambers* (see Figures 11 and 12) shall be provided where changes in both gradient and direction occur and where either is greater than 22.5°.

Amend 1
Sep 1993

3.7.5 Where the depth to the invert of the *drain* exceeds 1.0 m, an *inspection chamber* is not acceptable and an *access chamber* shall be used.

3.7.6 Drain under buildings

Any *drain* laid under a *building* shall be run in a straight line from one side to the other.

3.7.7 Access to a *drain* laid under a *building* shall be provided immediately outside the *building*. These points of access shall be located within 2.0 m of an exterior wall.

3.7.8 Under a *building* the only acceptable inlets to a *drain* are from sealed roof-water downpipes. Access shall be provided to the *drain* via a sealed access point in the downpipe immediately above ground floor level.

Figure 9: **Type-two Surface Water Sump**
Paragraph 3.6.2

Figure 10: **Typical Rodding Point**
Paragraph 3.7.1

Proposed E1 Surface Water - No changes proposed to this page

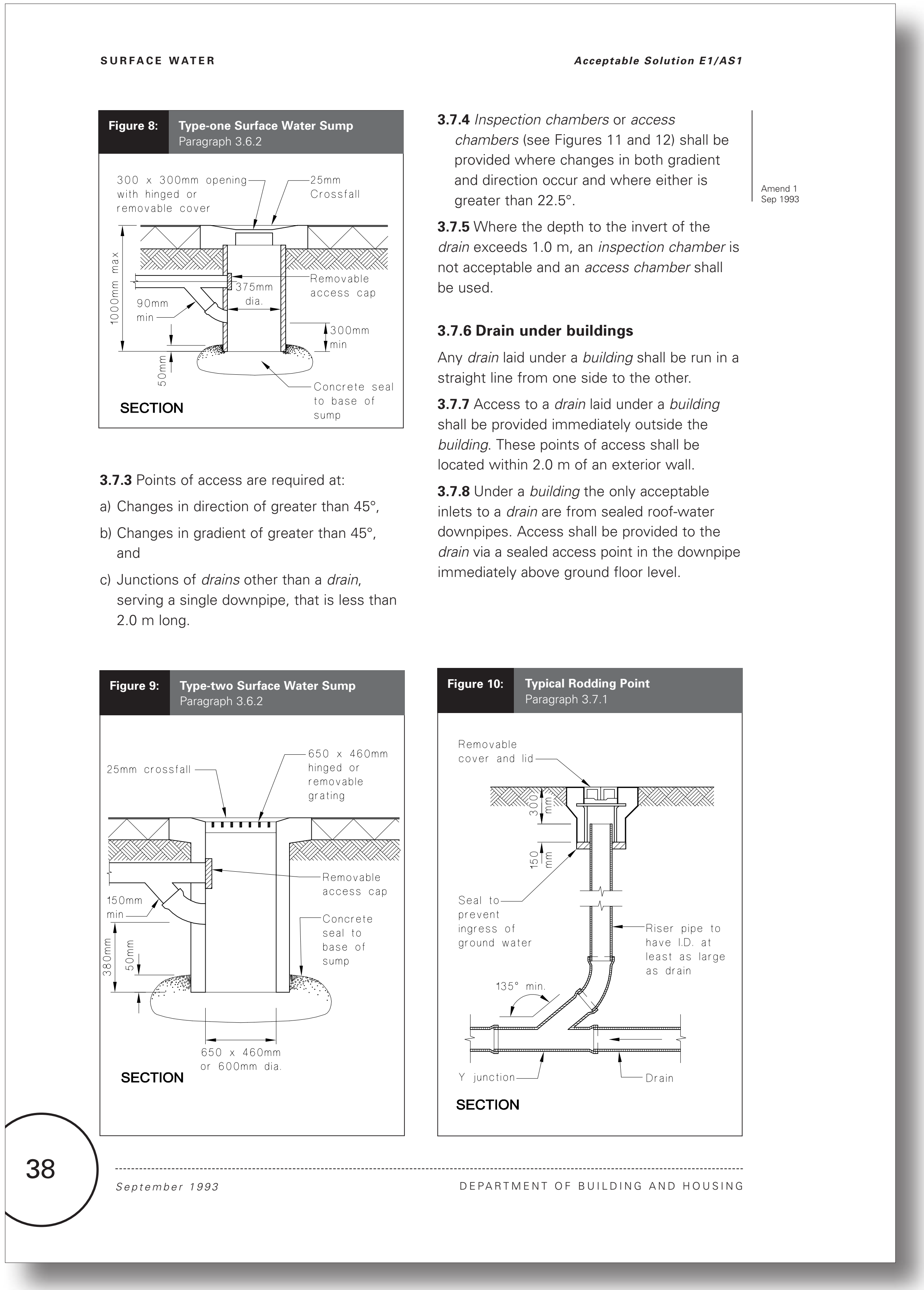

Figure 8: **Type-one Surface Water Sump**
Paragraph 3.6.2

3.7.3 Points of access are required at:

a) Changes in direction of greater than 45°,

b) Changes in gradient of greater than 45°, and

c) Junctions of *drains* other than a *drain*, serving a single downpipe, that is less than 2.0 m long.

3.7.4 *Inspection chambers* or *access chambers* (see Figures 11 and 12) shall be provided where changes in both gradient and direction occur and where either is greater than 22.5°.

Amend 1
Sep 1993

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Figure 9: **Type-two Surface Water Sump**
Paragraph 3.6.2

Figure 10: **Typical Rodding Point**
Paragraph 3.7.1

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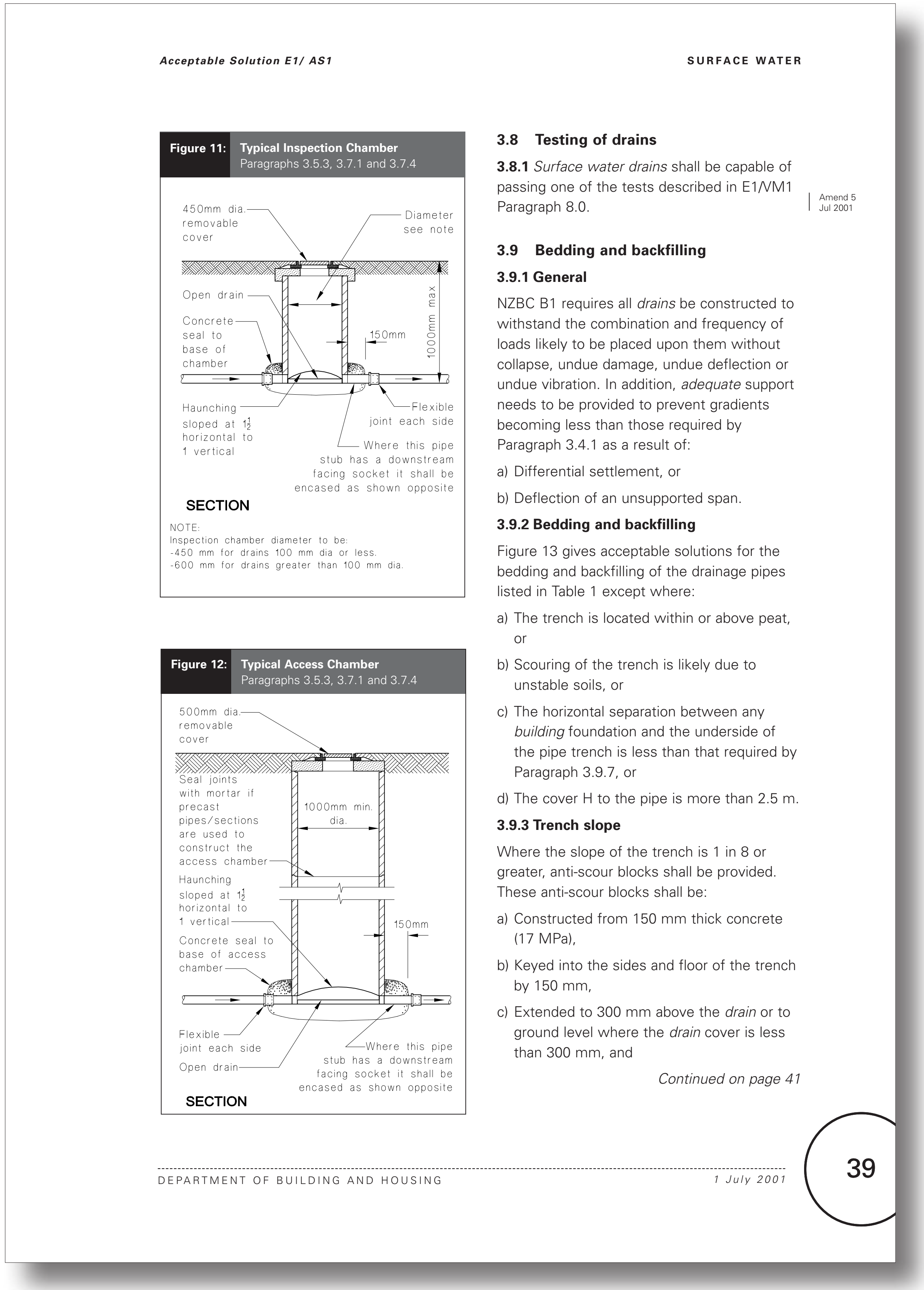

Acceptable Solution E1/ AS1 SURFACE WATER

Figure 11: **Typical Inspection Chamber**
Paragraphs 3.5.3, 3.7.1 and 3.7.4

NOTE:
Inspection chamber diameter to be:
-450 mm for drains 100 mm dia or less.
-600 mm for drains greater than 100 mm dia.

Figure 12: **Typical Access Chamber**
Paragraphs 3.5.3, 3.7.1 and 3.7.4

3.8 Testing of drains

3.8.1 *Surface water drains* shall be capable of passing one of the tests described in E1/VM1 Paragraph 8.0.

Amend 5 Jul 2001

3.9 Bedding and backfilling

3.9.1 General

NZBC B1 requires all *drains* be constructed to withstand the combination and frequency of loads likely to be placed upon them without collapse, undue damage, undue deflection or undue vibration. In addition, *adequate* support needs to be provided to prevent gradients becoming less than those required by Paragraph 3.4.1 as a result of:

a) Differential settlement, or

b) Deflection of an unsupported span.

3.9.2 Bedding and backfilling

Figure 13 gives acceptable solutions for the bedding and backfilling of the drainage pipes listed in Table 1 except where:

a) The trench is located within or above peat, or

b) Scouring of the trench is likely due to unstable soils, or

c) The horizontal separation between any *building* foundation and the underside of the pipe trench is less than that required by Paragraph 3.9.7, or

d) The cover H to the pipe is more than 2.5 m.

3.9.3 Trench slope

Where the slope of the trench is 1 in 8 or greater, anti-scour blocks shall be provided. These anti-scour blocks shall be:

a) Constructed from 150 mm thick concrete (17 MPa),

b) Keyed into the sides and floor of the trench by 150 mm,

c) Extended to 300 mm above the *drain* or to ground level where the *drain* cover is less than 300 mm, and

Continued on page 41

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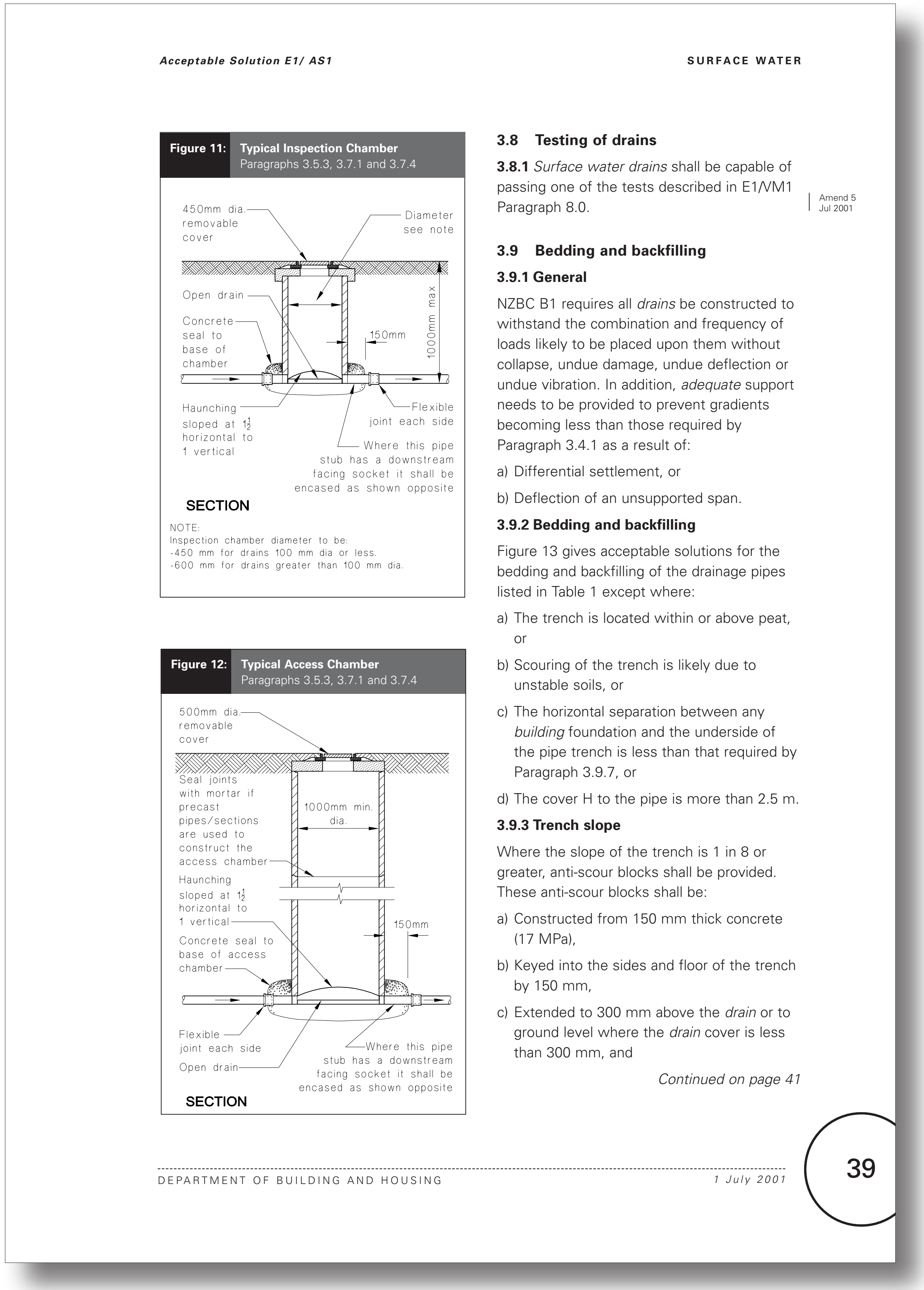
Proposed E1 Surface Water - No changes proposed to this page



Acceptable Solution E1/ AS1 SURFACE WATER

Figure 11: **Typical Inspection Chamber**
Paragraphs 3.5.3, 3.7.1 and 3.7.4

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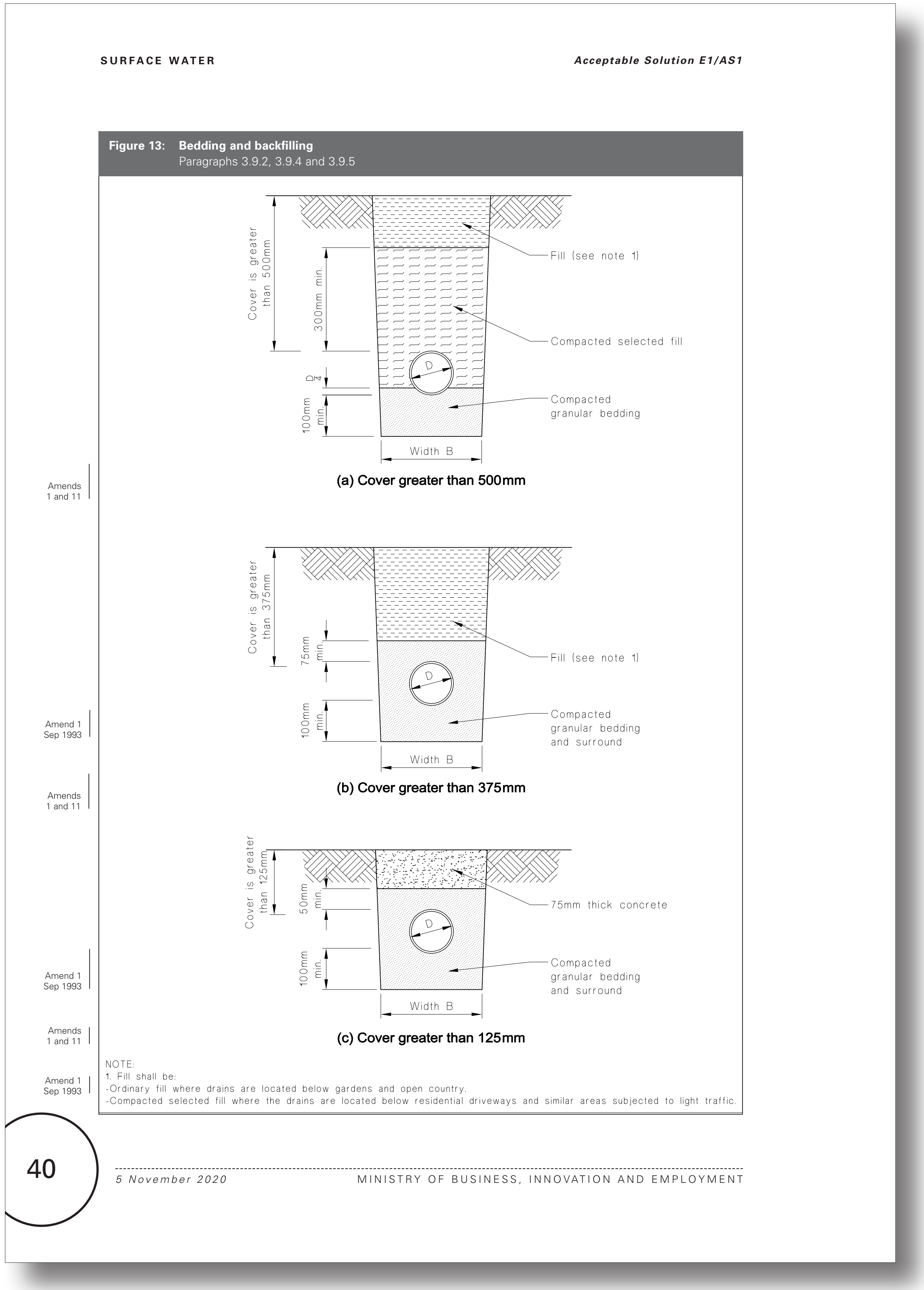
Continued on page 41

DEPARTMENT OF BUILDING AND HOUSING 1 July 2001 39

Current E1 Surface Water - No changes proposed to this page



SURFACE WATER

Acceptable Solution E1/AS1

Figure 13: **Bedding and backfilling**
Paragraphs 3.9.2, 3.9.4 and 3.9.5

Amends 1 and 11

(a) Cover greater than 500mm

Amend 1 Sep 1993

Amends 1 and 11

(b) Cover greater than 375mm

Amend 1 Sep 1993

Amends 1 and 11

(c) Cover greater than 125mm

Amend 1 Sep 1993

NOTE:
1. Fill shall be:
-Ordinary fill where drains are located below gardens and open country.
-Compacted selected fill where the drains are located below residential driveways and similar areas subjected to light traffic.

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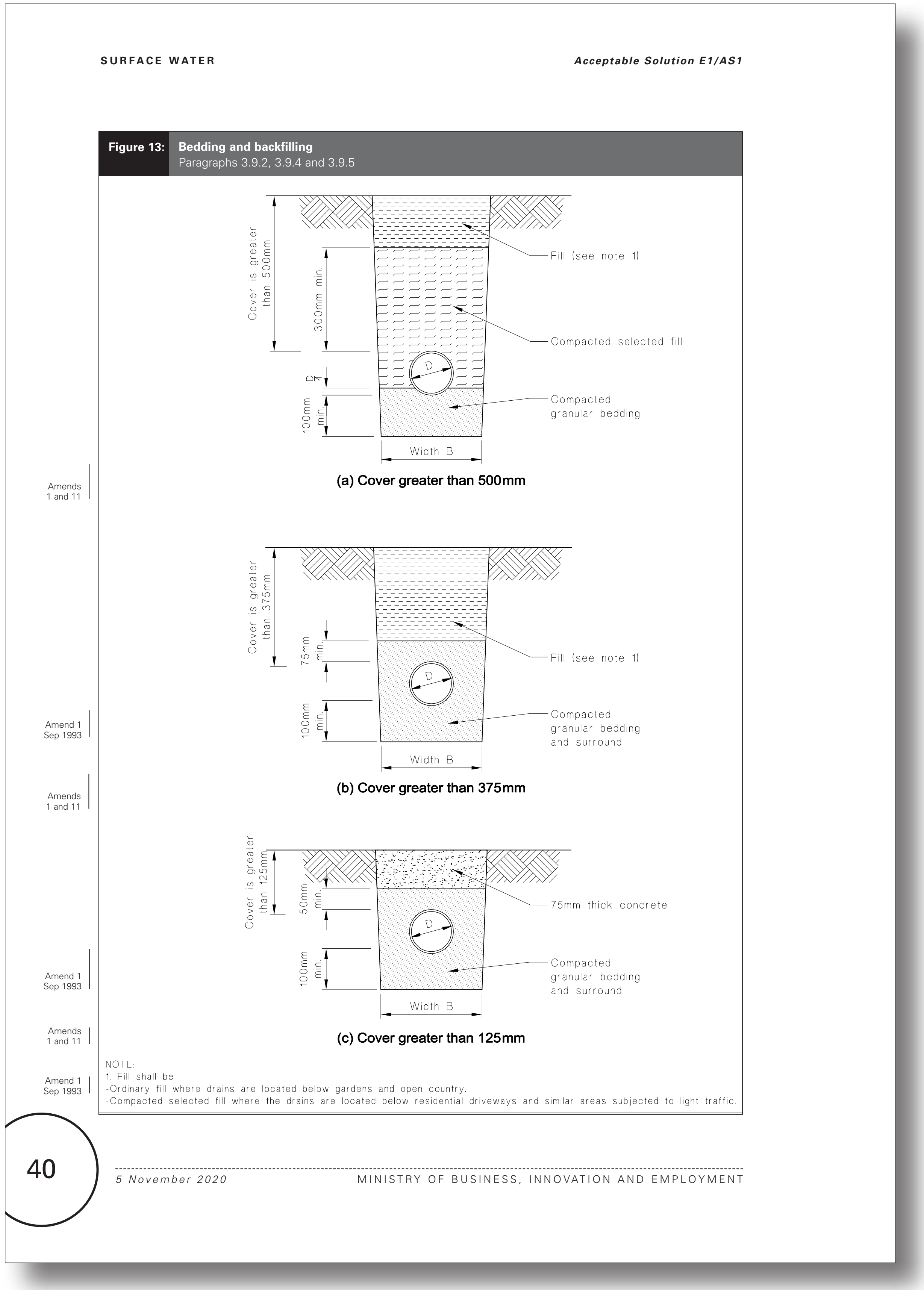
5 November 2020

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Proposed E1 Surface Water - No changes proposed to this page


SURFACE WATER

Acceptable Solution E1/AS1

Figure 13: **Bedding and backfilling**
Paragraphs 3.9.2, 3.9.4 and 3.9.5

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Amend 1 Sep 1993

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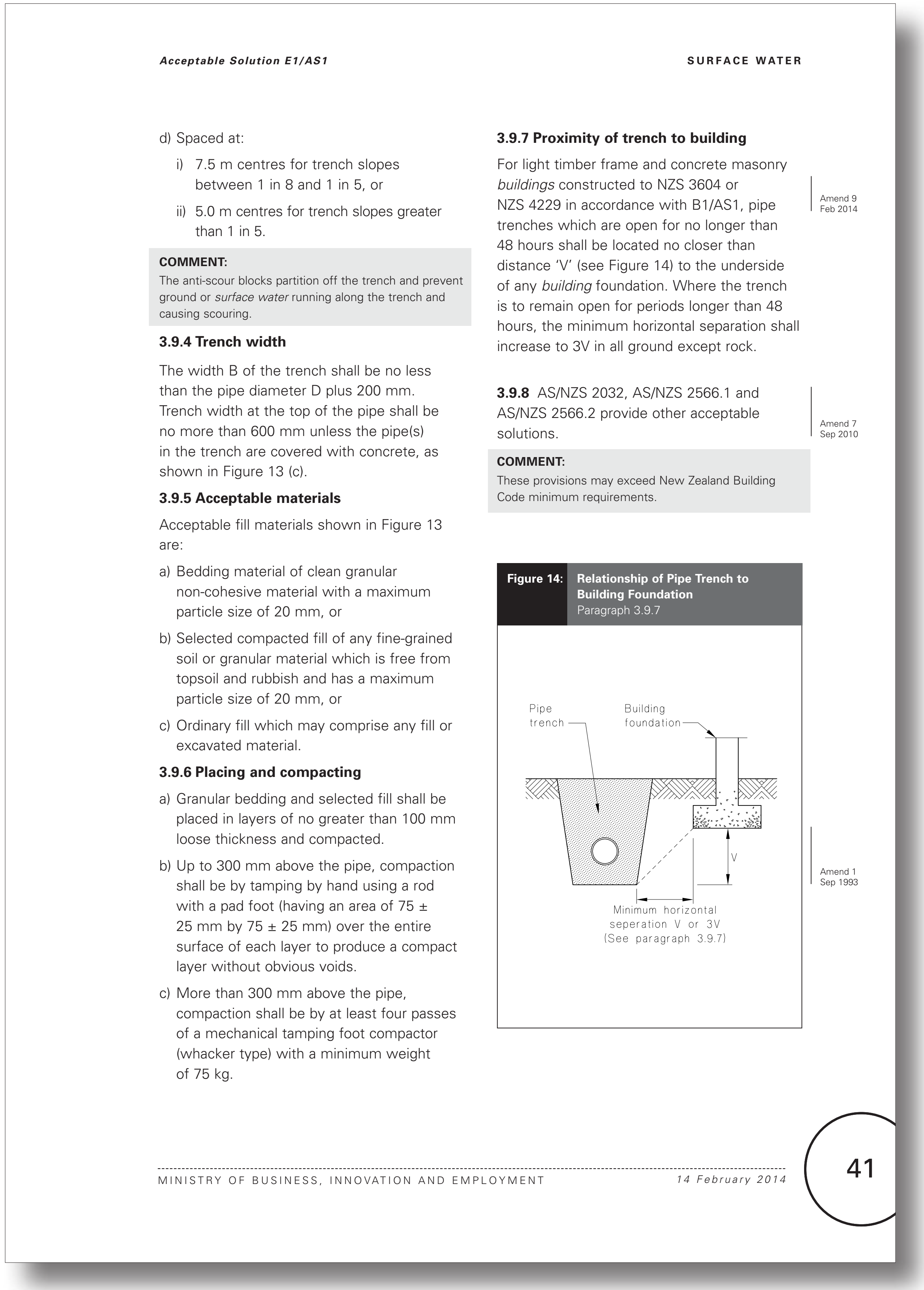
5 November 2020

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Current E1 Surface Water - No changes proposed to this page



d) Spaced at:

i) 7.5 m centres for trench slopes between 1 in 8 and 1 in 5, or

ii) 5.0 m centres for trench slopes greater than 1 in 5.

COMMENT:
The anti-scour blocks partition off the trench and prevent ground or *surface water* running along the trench and causing scouring.

3.9.4 Trench width

The width B of the trench shall be no less than the pipe diameter D plus 200 mm. Trench width at the top of the pipe shall be no more than 600 mm unless the pipe(s) in the trench are covered with concrete, as shown in Figure 13 (c).

3.9.5 Acceptable materials

Acceptable fill materials shown in Figure 13 are:

a) Bedding material of clean granular non-cohesive material with a maximum particle size of 20 mm, or

b) Selected compacted fill of any fine-grained soil or granular material which is free from topsoil and rubbish and has a maximum particle size of 20 mm, or

c) Ordinary fill which may comprise any fill or excavated material.

3.9.6 Placing and compacting

a) Granular bedding and selected fill shall be placed in layers of no greater than 100 mm loose thickness and compacted.

b) Up to 300 mm above the pipe, compaction shall be by tamping by hand using a rod with a pad foot (having an area of 75 ± 25 mm by 75 ± 25 mm) over the entire surface of each layer to produce a compact layer without obvious voids.

c) More than 300 mm above the pipe, compaction shall be by at least four passes of a mechanical tamping foot compactor (whacker type) with a minimum weight of 75 kg.

3.9.7 Proximity of trench to building

For light timber frame and concrete masonry *buildings* constructed to NZS 3604 or NZS 4229 in accordance with B1/AS1, pipe trenches which are open for no longer than 48 hours shall be located no closer than distance 'V' (see Figure 14) to the underside of any *building* foundation. Where the trench is to remain open for periods longer than 48 hours, the minimum horizontal separation shall increase to 3V in all ground except rock.

Amend 9 Feb 2014

3.9.8 AS/NZS 2032, AS/NZS 2566.1 and AS/NZS 2566.2 provide other acceptable solutions.

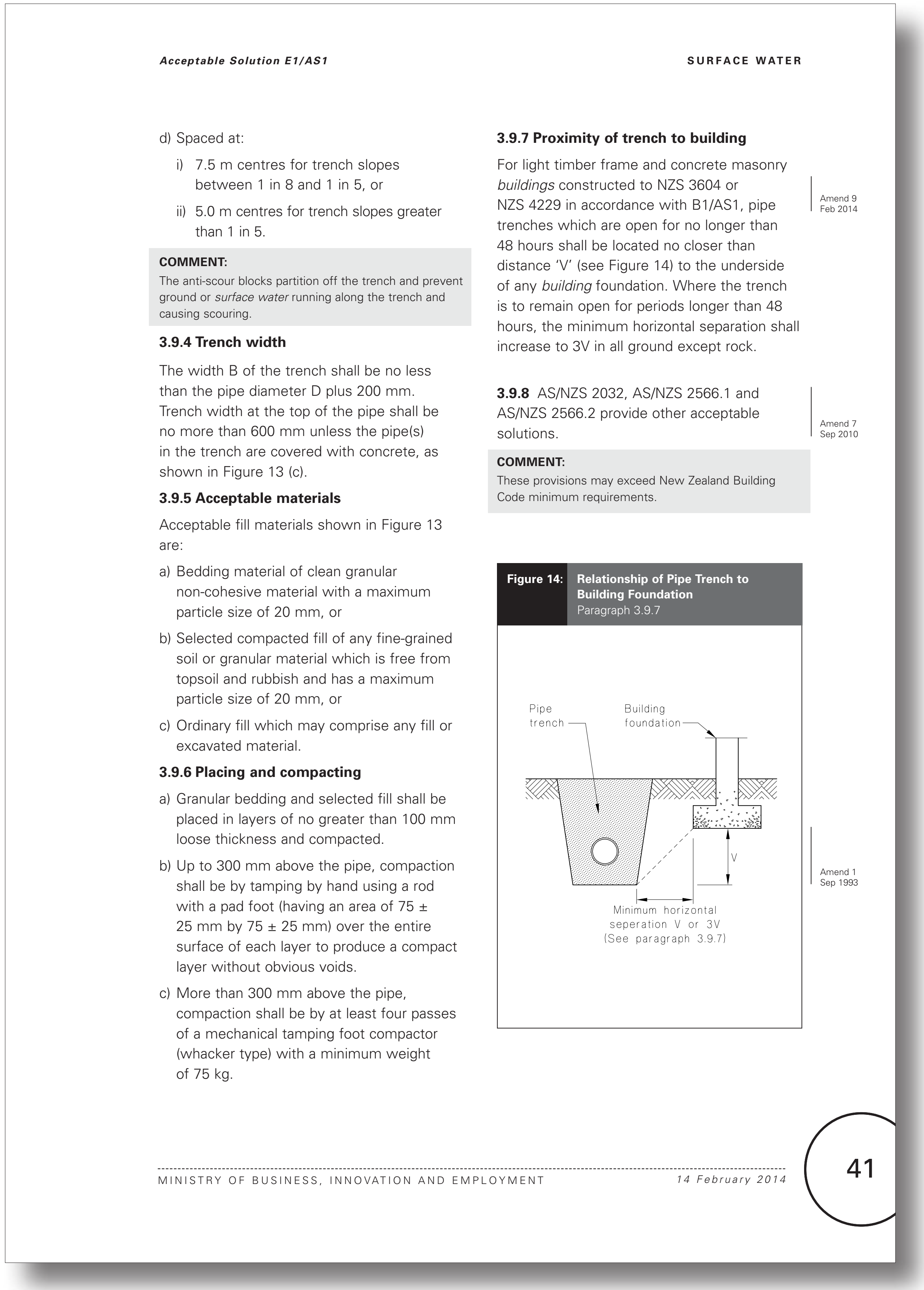
Amend 7 Sep 2010

COMMENT:
These provisions may exceed New Zealand Building Code minimum requirements.

Figure 14: **Relationship of Pipe Trench to Building Foundation**
Paragraph 3.9.7

Amend 1 Sep 1993

Proposed E1 Surface Water - No changes proposed to this page



Acceptable Solution E1/AS1 SURFACE WATER

d) Spaced at:

i) 7.5 m centres for trench slopes between 1 in 8 and 1 in 5, or

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c) Ordinary fill which may comprise any fill or excavated material.

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Amend 9 Feb 2014

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Amend 7 Sep 2010

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Figure 14: **Relationship of Pipe Trench to Building Foundation**
Paragraph 3.9.7

Amend 1 Sep 1993

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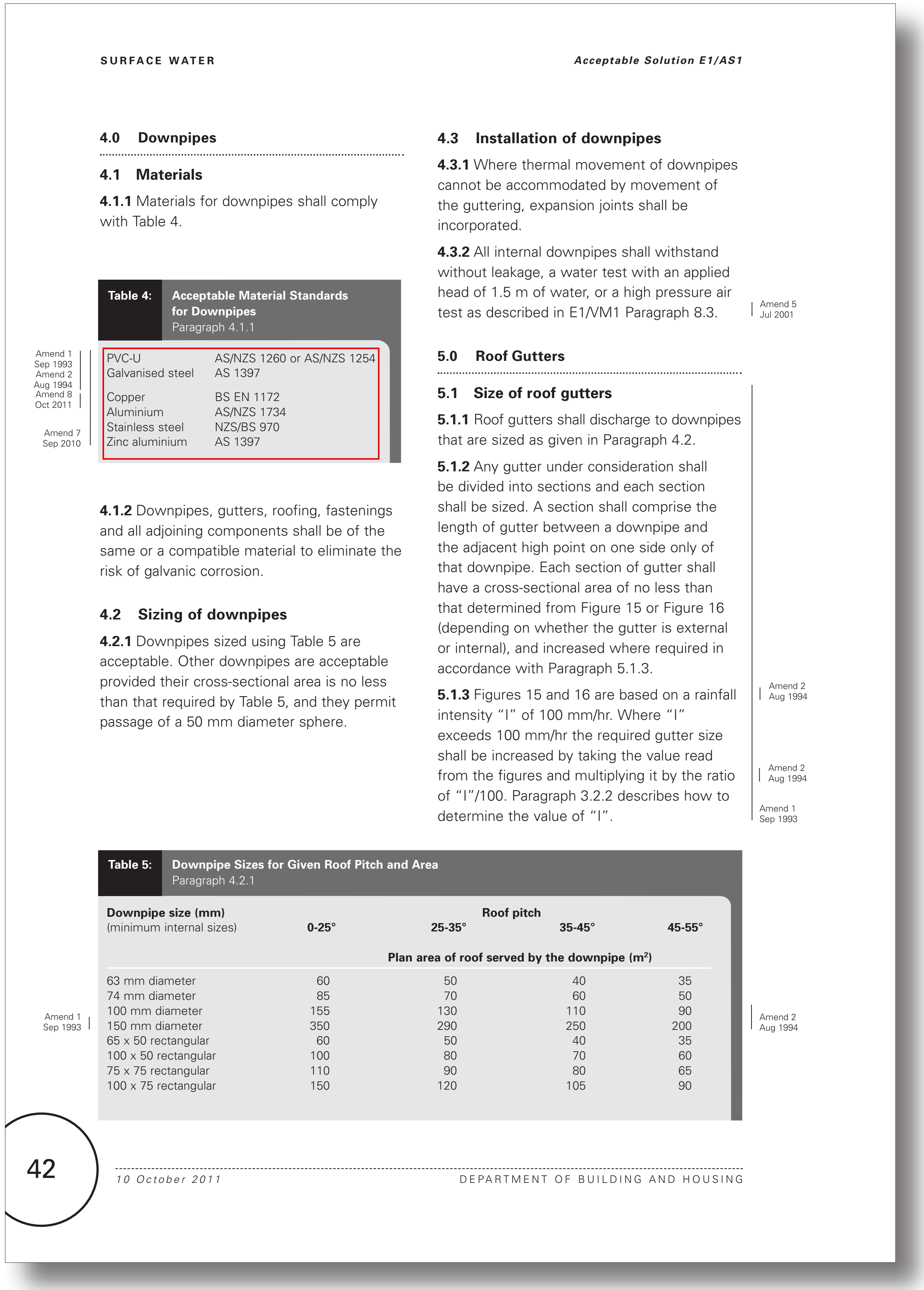
Current E1 Surface Water acceptable solutions and verification methods

(Text to be amended shown in red)



SURFACE WATER

Acceptable Solution E1/AS1

4.0 Downpipes

4.1 Materials

4.1.1 Materials for downpipes shall comply with Table 4.

Table 4: Acceptable Material Standards for Downpipes
Paragraph 4.1.1

PVC-U	AS/NZS 1260 or AS/NZS 1254
Galvanised steel	AS 1397
Copper	BS EN 1172
Aluminium	AS/NZS 1734
Stainless steel	NZS/BS 970
Zinc aluminium	AS 1397

Amend 1 Sep 1993
Amend 2 Aug 1994
Amend 8 Oct 2011
Amend 7 Sep 2010

4.1.2 Downpipes, gutters, roofing, fastenings and all adjoining components shall be of the same or a compatible material to eliminate the risk of galvanic corrosion.

4.2 Sizing of downpipes

4.2.1 Downpipes sized using Table 5 are acceptable. Other downpipes are acceptable provided their cross-sectional area is no less than that required by Table 5, and they permit passage of a 50 mm diameter sphere.

4.3 Installation of downpipes

4.3.1 Where thermal movement of downpipes cannot be accommodated by movement of the guttering, expansion joints shall be incorporated.

4.3.2 All internal downpipes shall withstand without leakage, a water test with an applied head of 1.5 m of water, or a high pressure air test as described in E1/VM1 Paragraph 8.3.

Amend 5 Jul 2001

5.0 Roof Gutters

5.1 Size of roof gutters

5.1.1 Roof gutters shall discharge to downpipes that are sized as given in Paragraph 4.2.

5.1.2 Any gutter under consideration shall be divided into sections and each section shall be sized. A section shall comprise the length of gutter between a downpipe and the adjacent high point on one side only of that downpipe. Each section of gutter shall have a cross-sectional area of no less than that determined from Figure 15 or Figure 16 (depending on whether the gutter is external or internal), and increased where required in accordance with Paragraph 5.1.3.

5.1.3 Figures 15 and 16 are based on a rainfall intensity "I" of 100 mm/hr. Where "I" exceeds 100 mm/hr the required gutter size shall be increased by taking the value read from the figures and multiplying it by the ratio of "I"/100. Paragraph 3.2.2 describes how to determine the value of "I".

Amend 2 Aug 1994
Amend 2 Aug 1994
Amend 1 Sep 1993

Table 5: Downpipe Sizes for Given Roof Pitch and Area
Paragraph 4.2.1

Downpipe size (mm) (minimum internal sizes)	**Roof pitch** 0-25°	25-35°	35-45°	45-55°
	Plan area of roof served by the downpipe (m^2)			
63 mm diameter	60	50	40	35
74 mm diameter	85	70	60	50
100 mm diameter	155	130	110	90
150 mm diameter	350	290	250	200
65 x 50 rectangular	60	50	40	35
100 x 50 rectangular	100	80	70	60
75 x 75 rectangular	110	90	80	65
100 x 75 rectangular	150	120	105	90

Amend 1 Sep 1993
Amend 2 Aug 1994

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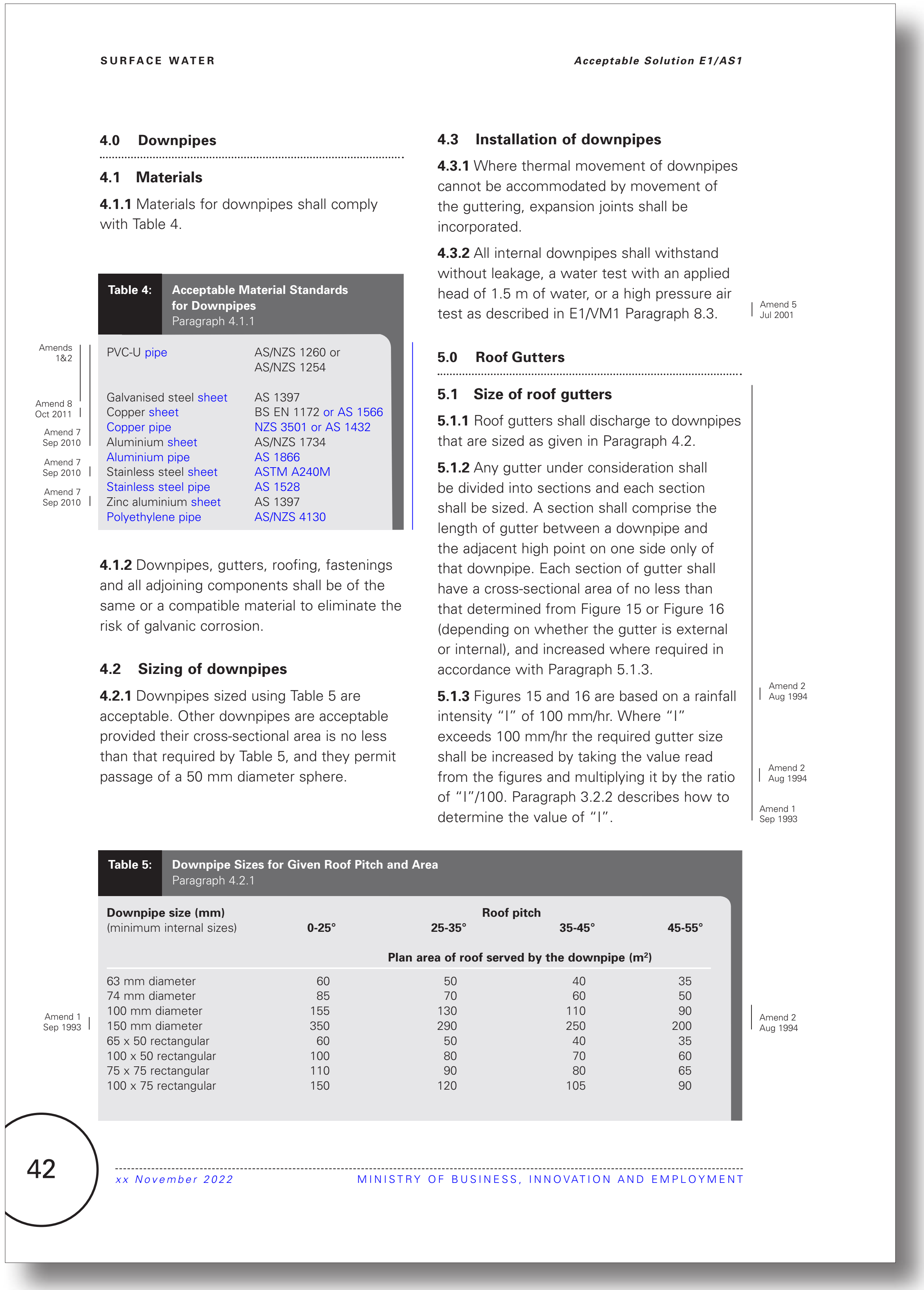
10 October 2011 DEPARTMENT OF BUILDING AND HOUSING

Proposed amendments to E1 Surface Water acceptable solutions and verification methods

(Proposed text in blue)



SURFACE WATER

Acceptable Solution E1/AS1

4.0 Downpipes

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Table 4: Acceptable Material Standards for Downpipes
Paragraph 4.1.1

PVC-U pipe	AS/NZS 1260 or AS/NZS 1254
Galvanised steel sheet	AS 1397
Copper sheet	BS EN 1172 or AS 1566
Copper pipe	NZS 3501 or AS 1432
Aluminium sheet	AS/NZS 1734
Aluminium pipe	AS 1866
Stainless steel sheet	ASTM A240M
Stainless steel pipe	AS 1528
Zinc aluminium sheet	AS 1397
Polyethylene pipe	AS/NZS 4130

Amends 1&2
Amend 8 Oct 2011
Amend 7 Sep 2010
Amend 7 Sep 2010
Amend 7 Sep 2010

4.1.2 Downpipes, gutters, roofing, fastenings and all adjoining components shall be of the same or a compatible material to eliminate the risk of galvanic corrosion.

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Amend 5 Jul 2001

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Amend 2 Aug 1994
Amend 2 Aug 1994
Amend 1 Sep 1993

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150 mm diameter	350	290	250	200
65 x 50 rectangular	60	50	40	35
100 x 50 rectangular	100	80	70	60
75 x 75 rectangular	110	90	80	65
100 x 75 rectangular	150	120	105	90

Amend 1 Sep 1993
Amend 2 Aug 1994

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xx November 2022 MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

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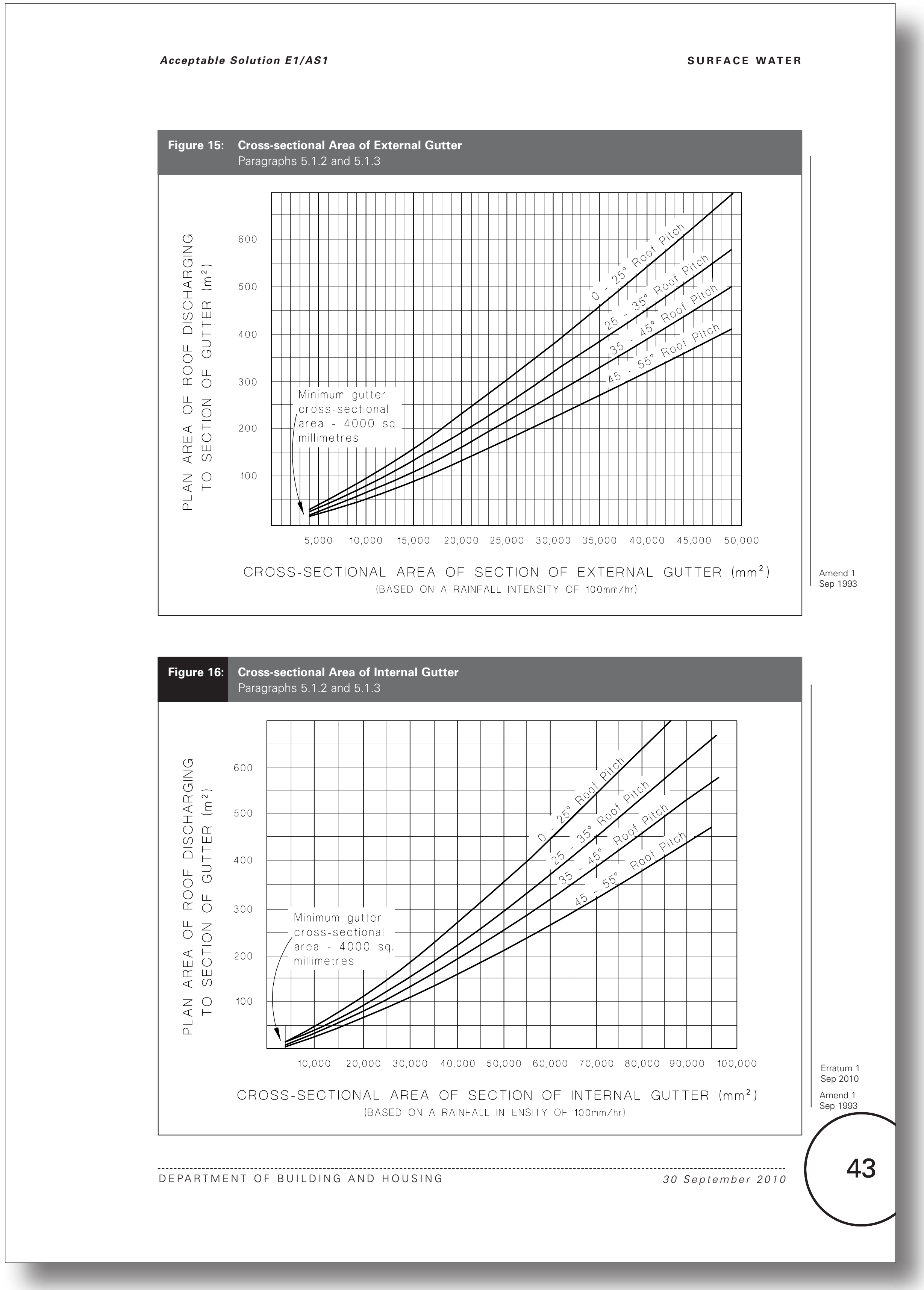

Acceptable Solution E1/AS1 SURFACE WATER

Figure 15: **Cross-sectional Area of External Gutter**
Paragraphs 5.1.2 and 5.1.3

Amend 1
Sep 1993

Figure 16: **Cross-sectional Area of Internal Gutter**
Paragraphs 5.1.2 and 5.1.3

Erratum 1
Sep 2010

Amend 1
Sep 1993

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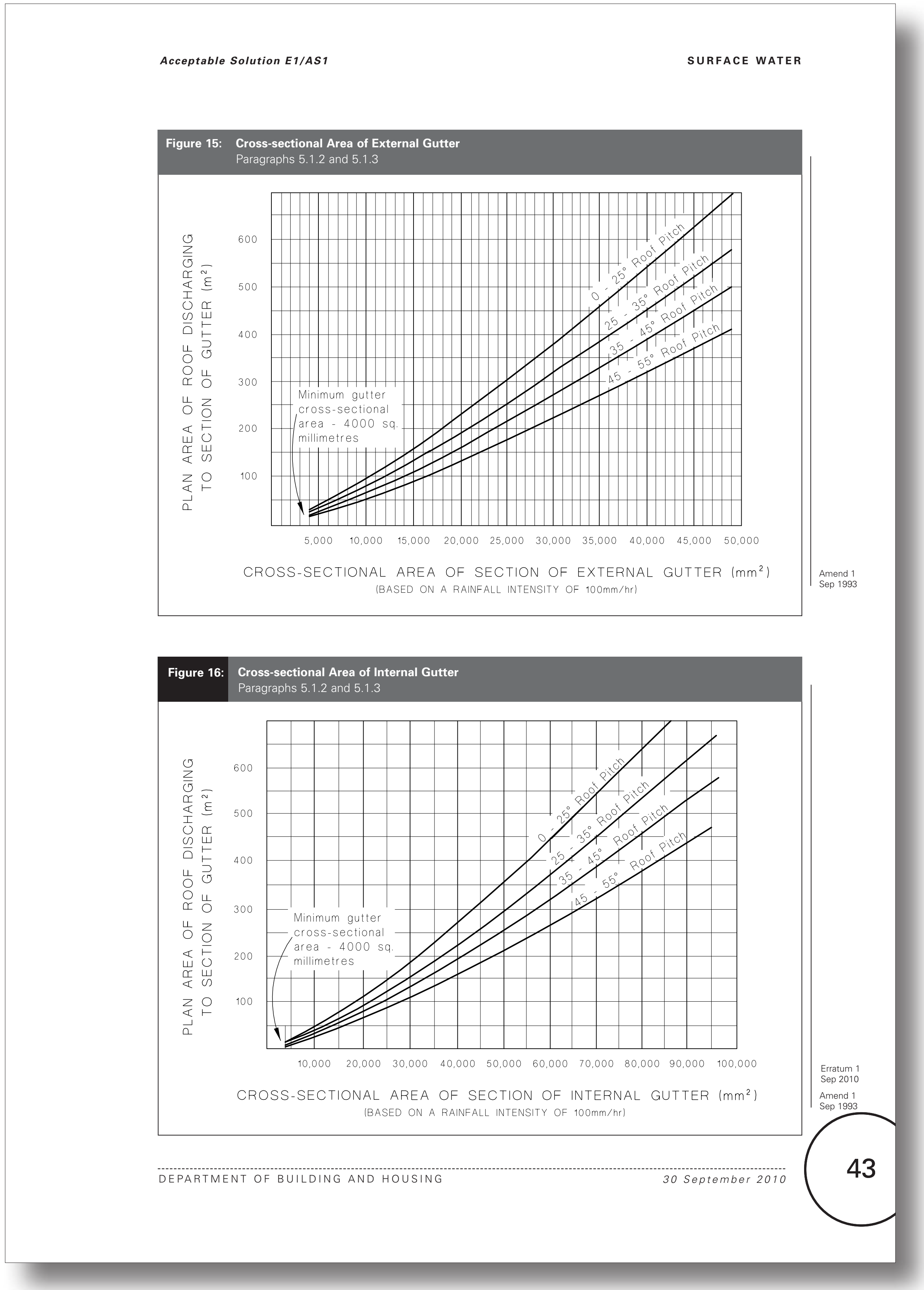
DEPARTMENT OF BUILDING AND HOUSING *30 September 2010*

Proposed E1 Surface Water - No changes proposed to this page



Acceptable Solution E1/AS1 SURFACE WATER

Figure 15: **Cross-sectional Area of External Gutter**
Paragraphs 5.1.2 and 5.1.3

Amend 1
Sep 1993

Figure 16: **Cross-sectional Area of Internal Gutter**
Paragraphs 5.1.2 and 5.1.3

Erratum 1
Sep 2010

Amend 1
Sep 1993

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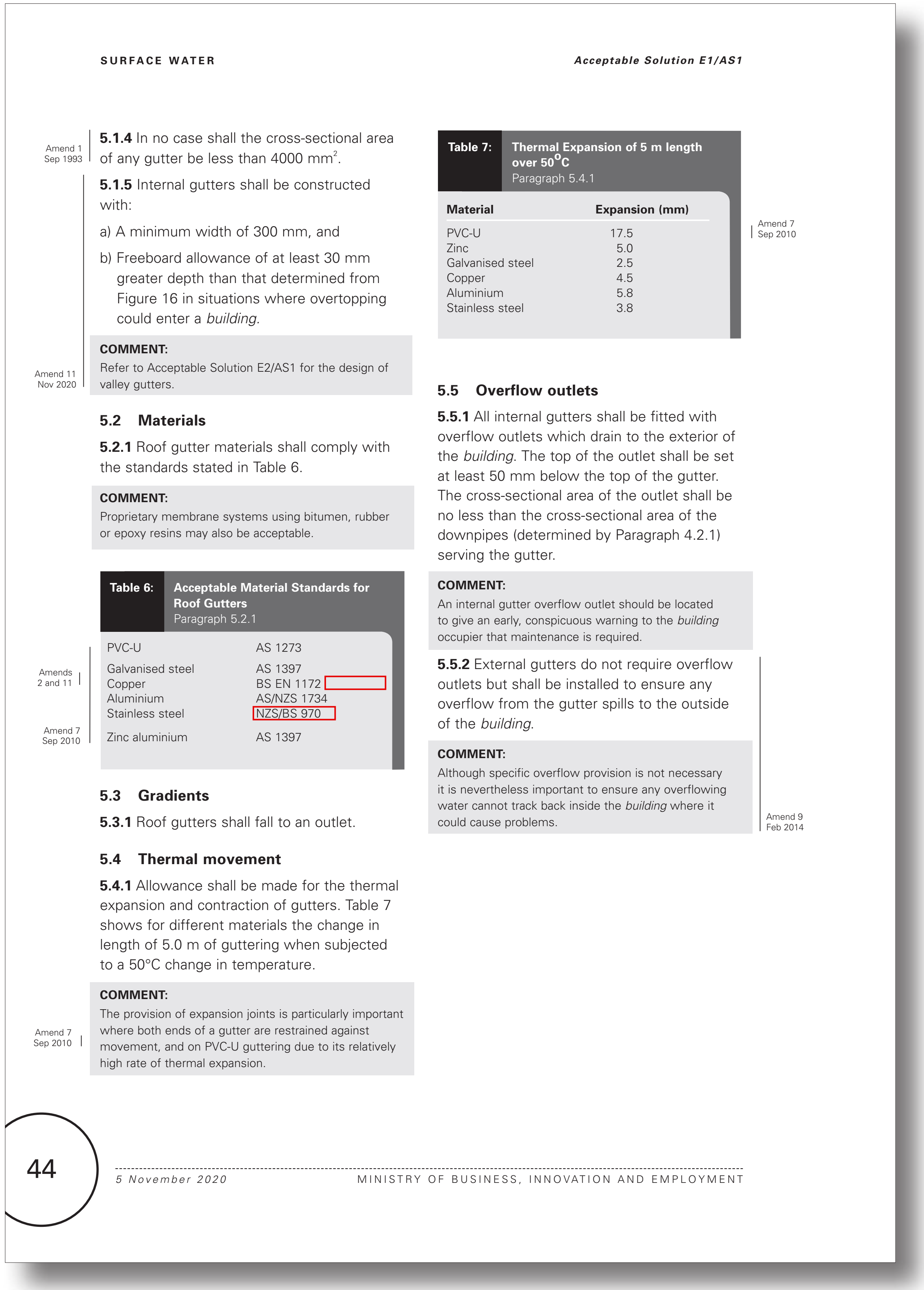
DEPARTMENT OF BUILDING AND HOUSING *30 September 2010*

Current E1 Surface Water acceptable solutions and verification methods

(Text to be amended shown in red)



SURFACE WATER — *Acceptable Solution E1/AS1*

Amend 1 Sep 1993

5.1.4 In no case shall the cross-sectional area of any gutter be less than 4000 mm^2.

5.1.5 Internal gutters shall be constructed with:

a) A minimum width of 300 mm, and

b) Freeboard allowance of at least 30 mm greater depth than that determined from Figure 16 in situations where overtopping could enter a *building*.

COMMENT:
Refer to Acceptable Solution E2/AS1 for the design of valley gutters.

Amend 11 Nov 2020

5.2 Materials

5.2.1 Roof gutter materials shall comply with the standards stated in Table 6.

COMMENT:
Proprietary membrane systems using bitumen, rubber or epoxy resins may also be acceptable.

Table 6: Acceptable Material Standards for Roof Gutters
Paragraph 5.2.1

PVC-U	AS 1273
Galvanised steel	AS 1397
Copper	BS EN 1172
Aluminium	AS/NZS 1734
Stainless steel	NZS/BS 970
Zinc aluminium	AS 1397

Amends 2 and 11
Amend 7 Sep 2010

5.3 Gradients

5.3.1 Roof gutters shall fall to an outlet.

5.4 Thermal movement

5.4.1 Allowance shall be made for the thermal expansion and contraction of gutters. Table 7 shows for different materials the change in length of 5.0 m of guttering when subjected to a 50°C change in temperature.

COMMENT:
The provision of expansion joints is particularly important where both ends of a gutter are restrained against movement, and on PVC-U guttering due to its relatively high rate of thermal expansion.

Amend 7 Sep 2010

Table 7: Thermal Expansion of 5 m length over 50°C
Paragraph 5.4.1

Material	Expansion (mm)
PVC-U	17.5
Zinc	5.0
Galvanised steel	2.5
Copper	4.5
Aluminium	5.8
Stainless steel	3.8

Amend 7 Sep 2010

5.5 Overflow outlets

5.5.1 All internal gutters shall be fitted with overflow outlets which drain to the exterior of the *building*. The top of the outlet shall be set at least 50 mm below the top of the gutter. The cross-sectional area of the outlet shall be no less than the cross-sectional area of the downpipes (determined by Paragraph 4.2.1) serving the gutter.

COMMENT:
An internal gutter overflow outlet should be located to give an early, conspicuous warning to the *building* occupier that maintenance is required.

5.5.2 External gutters do not require overflow outlets but shall be installed to ensure any overflow from the gutter spills to the outside of the *building*.

COMMENT:
Although specific overflow provision is not necessary it is nevertheless important to ensure any overflowing water cannot track back inside the *building* where it could cause problems.

Amend 9 Feb 2014

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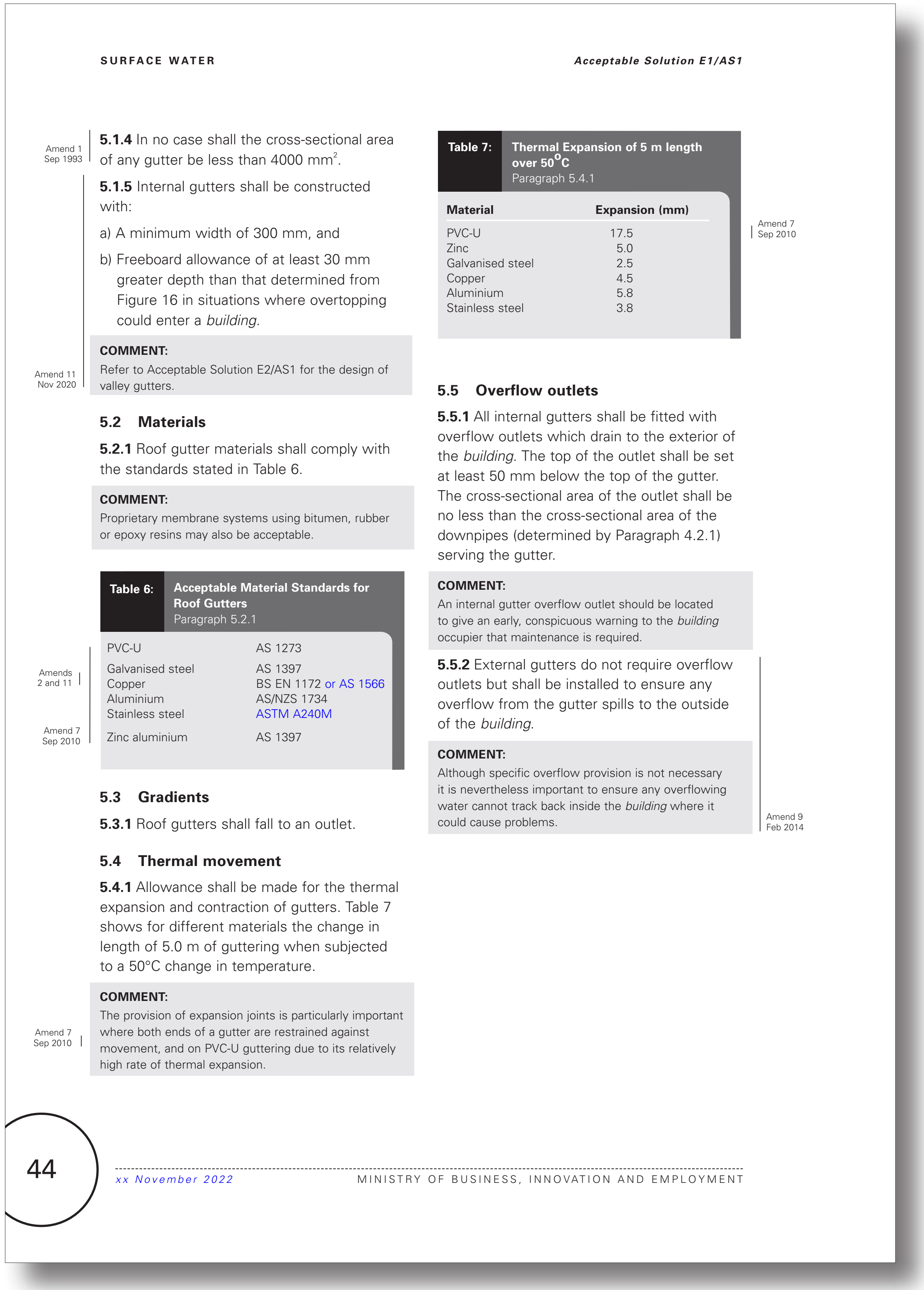
5 November 2020 MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Proposed amendments to E1 Surface Water acceptable solutions and verification methods (Proposed text in blue)



SURFACE WATER — *Acceptable Solution E1/AS1*

Amend 1 Sep 1993

5.1.4 In no case shall the cross-sectional area of any gutter be less than 4000 mm^2.

5.1.5 Internal gutters shall be constructed with:

a) A minimum width of 300 mm, and

b) Freeboard allowance of at least 30 mm greater depth than that determined from Figure 16 in situations where overtopping could enter a *building*.

COMMENT:
Refer to Acceptable Solution E2/AS1 for the design of valley gutters.

Amend 11 Nov 2020

5.2 Materials

5.2.1 Roof gutter materials shall comply with the standards stated in Table 6.

COMMENT:
Proprietary membrane systems using bitumen, rubber or epoxy resins may also be acceptable.

Table 6: Acceptable Material Standards for Roof Gutters
Paragraph 5.2.1

PVC-U	AS 1273
Galvanised steel	AS 1397
Copper	BS EN 1172 or AS 1566
Aluminium	AS/NZS 1734
Stainless steel	ASTM A240M
Zinc aluminium	AS 1397

Amends 2 and 11
Amend 7 Sep 2010

5.3 Gradients

5.3.1 Roof gutters shall fall to an outlet.

5.4 Thermal movement

5.4.1 Allowance shall be made for the thermal expansion and contraction of gutters. Table 7 shows for different materials the change in length of 5.0 m of guttering when subjected to a 50°C change in temperature.

COMMENT:
The provision of expansion joints is particularly important where both ends of a gutter are restrained against movement, and on PVC-U guttering due to its relatively high rate of thermal expansion.

Amend 7 Sep 2010

Table 7: Thermal Expansion of 5 m length over 50°C
Paragraph 5.4.1

Material	Expansion (mm)
PVC-U	17.5
Zinc	5.0
Galvanised steel	2.5
Copper	4.5
Aluminium	5.8
Stainless steel	3.8

Amend 7 Sep 2010

5.5 Overflow outlets

5.5.1 All internal gutters shall be fitted with overflow outlets which drain to the exterior of the *building*. The top of the outlet shall be set at least 50 mm below the top of the gutter. The cross-sectional area of the outlet shall be no less than the cross-sectional area of the downpipes (determined by Paragraph 4.2.1) serving the gutter.

COMMENT:
An internal gutter overflow outlet should be located to give an early, conspicuous warning to the *building* occupier that maintenance is required.

5.5.2 External gutters do not require overflow outlets but shall be installed to ensure any overflow from the gutter spills to the outside of the *building*.

COMMENT:
Although specific overflow provision is not necessary it is nevertheless important to ensure any overflowing water cannot track back inside the *building* where it could cause problems.

Amend 9 Feb 2014

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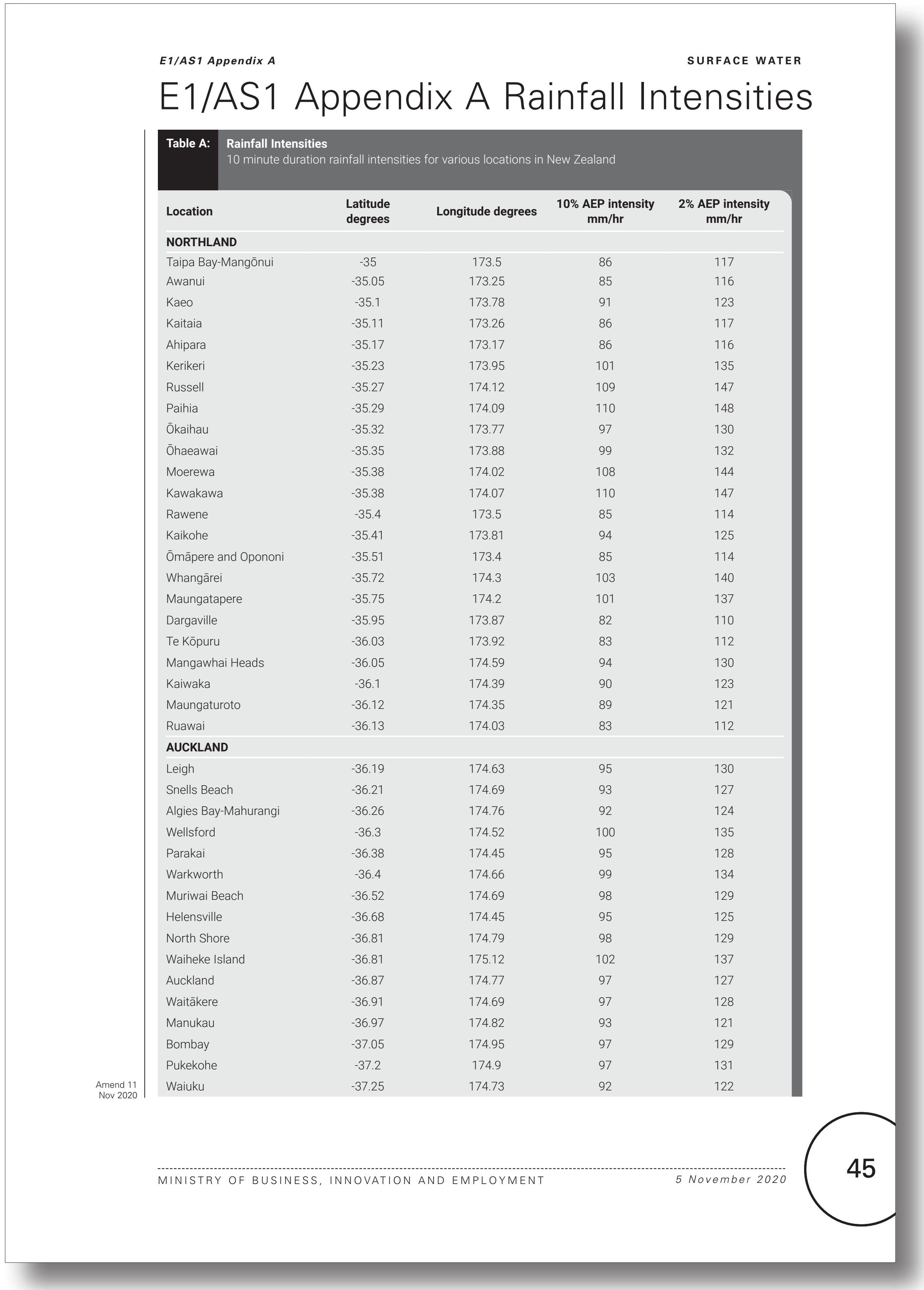
Current E1 Surface Water - No changes proposed to this page



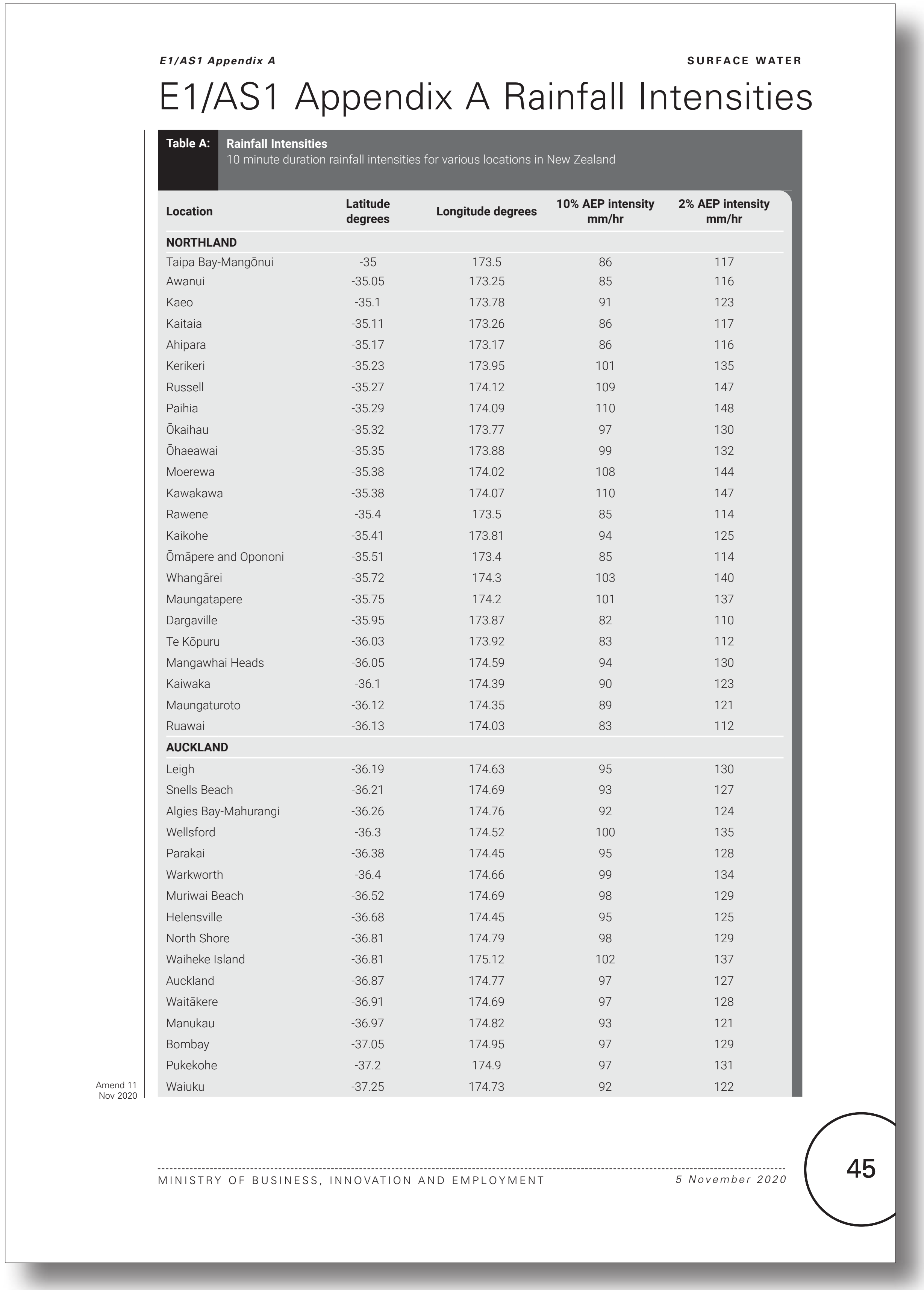
E1/AS1 Appendix A Rainfall Intensities

Table A: **Rainfall Intensities**
10 minute duration rainfall intensities for various locations in New Zealand

Location	Latitude degrees	Longitude degrees	10% AEP intensity mm/hr	2% AEP intensity mm/hr
NORTHLAND				
Taipa Bay-Mangōnui	-35	173.5	86	117
Awanui	-35.05	173.25	85	116
Kaeo	-35.1	173.78	91	123
Kaitaia	-35.11	173.26	86	117
Ahipara	-35.17	173.17	86	116
Kerikeri	-35.23	173.95	101	135
Russell	-35.27	174.12	109	147
Paihia	-35.29	174.09	110	148
Ōkaihau	-35.32	173.77	97	130
Ōhaeawai	-35.35	173.88	99	132
Moerewa	-35.38	174.02	108	144
Kawakawa	-35.38	174.07	110	147
Rawene	-35.4	173.5	85	114
Kaikohe	-35.41	173.81	94	125
Ōmāpere and Opononi	-35.51	173.4	85	114
Whangārei	-35.72	174.3	103	140
Maungatapere	-35.75	174.2	101	137
Dargaville	-35.95	173.87	82	110
Te Kōpuru	-36.03	173.92	83	112
Mangawhai Heads	-36.05	174.59	94	130
Kaiwaka	-36.1	174.39	90	123
Maungaturoto	-36.12	174.35	89	121
Ruawai	-36.13	174.03	83	112
AUCKLAND				
Leigh	-36.19	174.63	95	130
Snells Beach	-36.21	174.69	93	127
Algies Bay-Mahurangi	-36.26	174.76	92	124
Wellsford	-36.3	174.52	100	135
Parakai	-36.38	174.45	95	128
Warkworth	-36.4	174.66	99	134
Muriwai Beach	-36.52	174.69	98	129
Helensville	-36.68	174.45	95	125
North Shore	-36.81	174.79	98	129
Waiheke Island	-36.81	175.12	102	137
Auckland	-36.87	174.77	97	127
Waitākere	-36.91	174.69	97	128
Manukau	-36.97	174.82	93	121
Bombay	-37.05	174.95	97	129
Pukekohe	-37.2	174.9	97	131
Waiuku	-37.25	174.73	92	122

Amend 11
Nov 2020

Proposed E1 Surface Water - No changes proposed to this page



E1/AS1 Appendix A SURFACE WATER

E1/AS1 Appendix A Rainfall Intensities

Table A: **Rainfall Intensities**
10 minute duration rainfall intensities for various locations in New Zealand

Location	Latitude degrees	Longitude degrees	10% AEP intensity mm/hr	2% AEP intensity mm/hr
NORTHLAND				
Taipa Bay-Mangōnui	-35	173.5	86	117
Awanui	-35.05	173.25	85	116
Kaeo	-35.1	173.78	91	123
Kaitaia	-35.11	173.26	86	117
Ahipara	-35.17	173.17	86	116
Kerikeri	-35.23	173.95	101	135
Russell	-35.27	174.12	109	147
Paihia	-35.29	174.09	110	148
Ōkaihau	-35.32	173.77	97	130
Ōhaeawai	-35.35	173.88	99	132
Moerewa	-35.38	174.02	108	144
Kawakawa	-35.38	174.07	110	147
Rawene	-35.4	173.5	85	114
Kaikohe	-35.41	173.81	94	125
Ōmāpere and Opononi	-35.51	173.4	85	114
Whangārei	-35.72	174.3	103	140
Maungatapere	-35.75	174.2	101	137
Dargaville	-35.95	173.87	82	110
Te Kōpuru	-36.03	173.92	83	112
Mangawhai Heads	-36.05	174.59	94	130
Kaiwaka	-36.1	174.39	90	123
Maungaturoto	-36.12	174.35	89	121
Ruawai	-36.13	174.03	83	112
AUCKLAND				
Leigh	-36.19	174.63	95	130
Snells Beach	-36.21	174.69	93	127
Algies Bay-Mahurangi	-36.26	174.76	92	124
Wellsford	-36.3	174.52	100	135
Parakai	-36.38	174.45	95	128
Warkworth	-36.4	174.66	99	134
Muriwai Beach	-36.52	174.69	98	129
Helensville	-36.68	174.45	95	125
North Shore	-36.81	174.79	98	129
Waiheke Island	-36.81	175.12	102	137
Auckland	-36.87	174.77	97	127
Waitākere	-36.91	174.69	97	128
Manukau	-36.97	174.82	93	121
Bombay	-37.05	174.95	97	129
Pukekohe	-37.2	174.9	97	131
Waiuku	-37.25	174.73	92	122

Amend 11
Nov 2020

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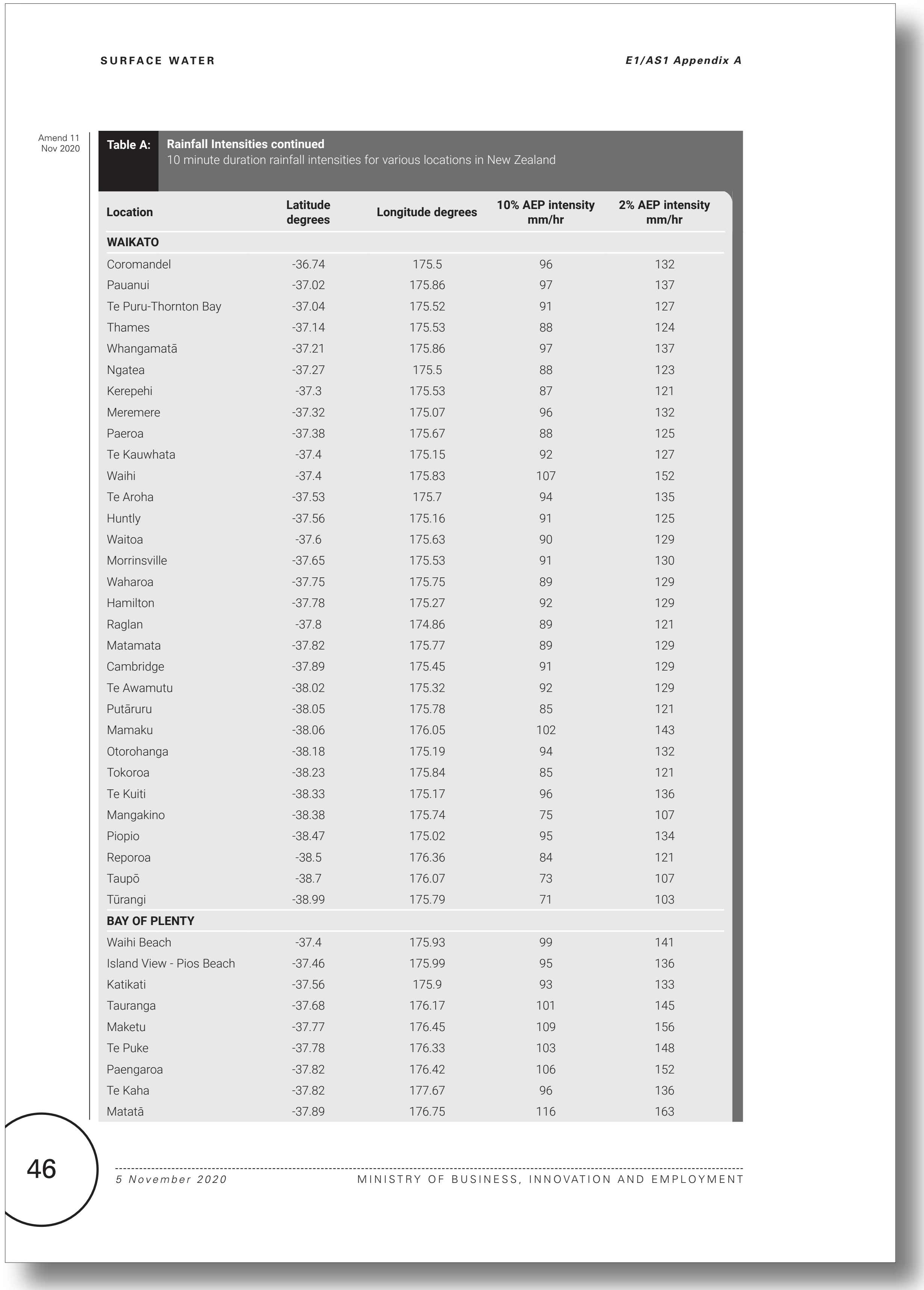
Current E1 Surface Water - No changes proposed to this page

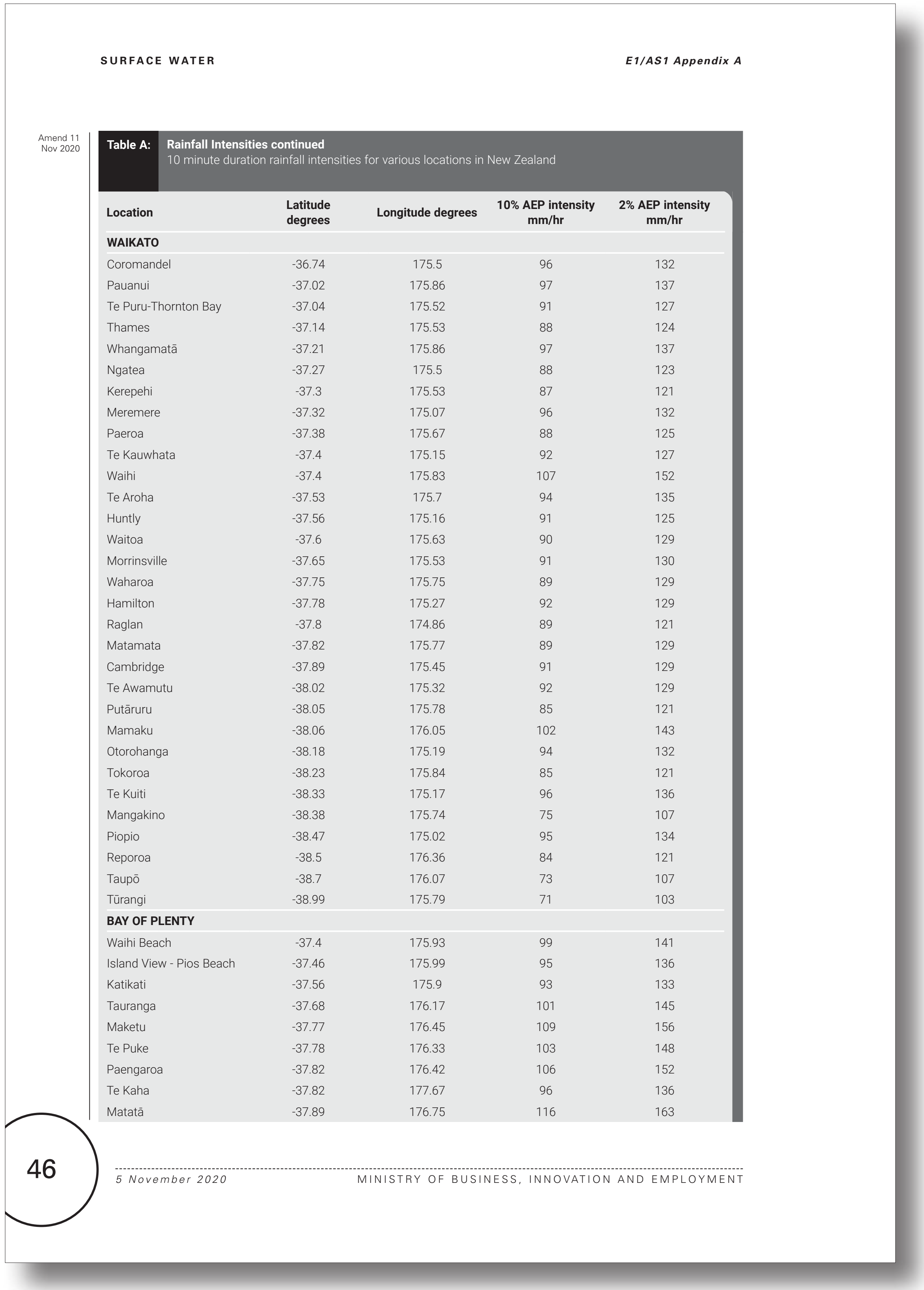


Amend 11 Nov 2020

Table A: **Rainfall Intensities continued**
10 minute duration rainfall intensities for various locations in New Zealand

Location	Latitude degrees	Longitude degrees	10% AEP intensity mm/hr	2% AEP intensity mm/hr
WAIKATO				
Coromandel	-36.74	175.5	96	132
Pauanui	-37.02	175.86	97	137
Te Puru-Thornton Bay	-37.04	175.52	91	127
Thames	-37.14	175.53	88	124
Whangamatā	-37.21	175.86	97	137
Ngatea	-37.27	175.5	88	123
Kerepehi	-37.3	175.53	87	121
Meremere	-37.32	175.07	96	132
Paeroa	-37.38	175.67	88	125
Te Kauwhata	-37.4	175.15	92	127
Waihi	-37.4	175.83	107	152
Te Aroha	-37.53	175.7	94	135
Huntly	-37.56	175.16	91	125
Waitoa	-37.6	175.63	90	129
Morrinsville	-37.65	175.53	91	130
Waharoa	-37.75	175.75	89	129
Hamilton	-37.78	175.27	92	129
Raglan	-37.8	174.86	89	121
Matamata	-37.82	175.77	89	129
Cambridge	-37.89	175.45	91	129
Te Awamutu	-38.02	175.32	92	129
Putāruru	-38.05	175.78	85	121
Mamaku	-38.06	176.05	102	143
Otorohanga	-38.18	175.19	94	132
Tokoroa	-38.23	175.84	85	121
Te Kuiti	-38.33	175.17	96	136
Mangakino	-38.38	175.74	75	107
Piopio	-38.47	175.02	95	134
Reporoa	-38.5	176.36	84	121
Taupō	-38.7	176.07	73	107
Tūrangi	-38.99	175.79	71	103
BAY OF PLENTY				
Waihi Beach	-37.4	175.93	99	141
Island View - Pios Beach	-37.46	175.99	95	136
Katikati	-37.56	175.9	93	133
Tauranga	-37.68	176.17	101	145
Maketu	-37.77	176.45	109	156
Te Puke	-37.78	176.33	103	148
Paengaroa	-37.82	176.42	106	152
Te Kaha	-37.82	177.67	96	136
Matatā	-37.89	176.75	116	163

Proposed E1 Surface Water - No changes proposed to this page



SURFACE WATER E1/AS1 Appendix A

Amend 11 Nov 2020

Table A: **Rainfall Intensities continued**
10 minute duration rainfall intensities for various locations in New Zealand

Location	Latitude degrees	Longitude degrees	10% AEP intensity mm/hr	2% AEP intensity mm/hr
WAIKATO				
Coromandel	-36.74	175.5	96	132
Pauanui	-37.02	175.86	97	137
Te Puru-Thornton Bay	-37.04	175.52	91	127
Thames	-37.14	175.53	88	124
Whangamatā	-37.21	175.86	97	137
Ngatea	-37.27	175.5	88	123
Kerepehi	-37.3	175.53	87	121
Meremere	-37.32	175.07	96	132
Paeroa	-37.38	175.67	88	125
Te Kauwhata	-37.4	175.15	92	127
Waihi	-37.4	175.83	107	152
Te Aroha	-37.53	175.7	94	135
Huntly	-37.56	175.16	91	125
Waitoa	-37.6	175.63	90	129
Morrinsville	-37.65	175.53	91	130
Waharoa	-37.75	175.75	89	129
Hamilton	-37.78	175.27	92	129
Raglan	-37.8	174.86	89	121
Matamata	-37.82	175.77	89	129
Cambridge	-37.89	175.45	91	129
Te Awamutu	-38.02	175.32	92	129
Putāruru	-38.05	175.78	85	121
Mamaku	-38.06	176.05	102	143
Otorohanga	-38.18	175.19	94	132
Tokoroa	-38.23	175.84	85	121
Te Kuiti	-38.33	175.17	96	136
Mangakino	-38.38	175.74	75	107
Piopio	-38.47	175.02	95	134
Reporoa	-38.5	176.36	84	121
Taupō	-38.7	176.07	73	107
Tūrangi	-38.99	175.79	71	103
BAY OF PLENTY				
Waihi Beach	-37.4	175.93	99	141
Island View - Pios Beach	-37.46	175.99	95	136
Katikati	-37.56	175.9	93	133
Tauranga	-37.68	176.17	101	145
Maketu	-37.77	176.45	109	156
Te Puke	-37.78	176.33	103	148
Paengaroa	-37.82	176.42	106	152
Te Kaha	-37.82	177.67	96	136
Matatā	-37.89	176.75	116	163

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Current E1 Surface Water - No changes proposed to this page

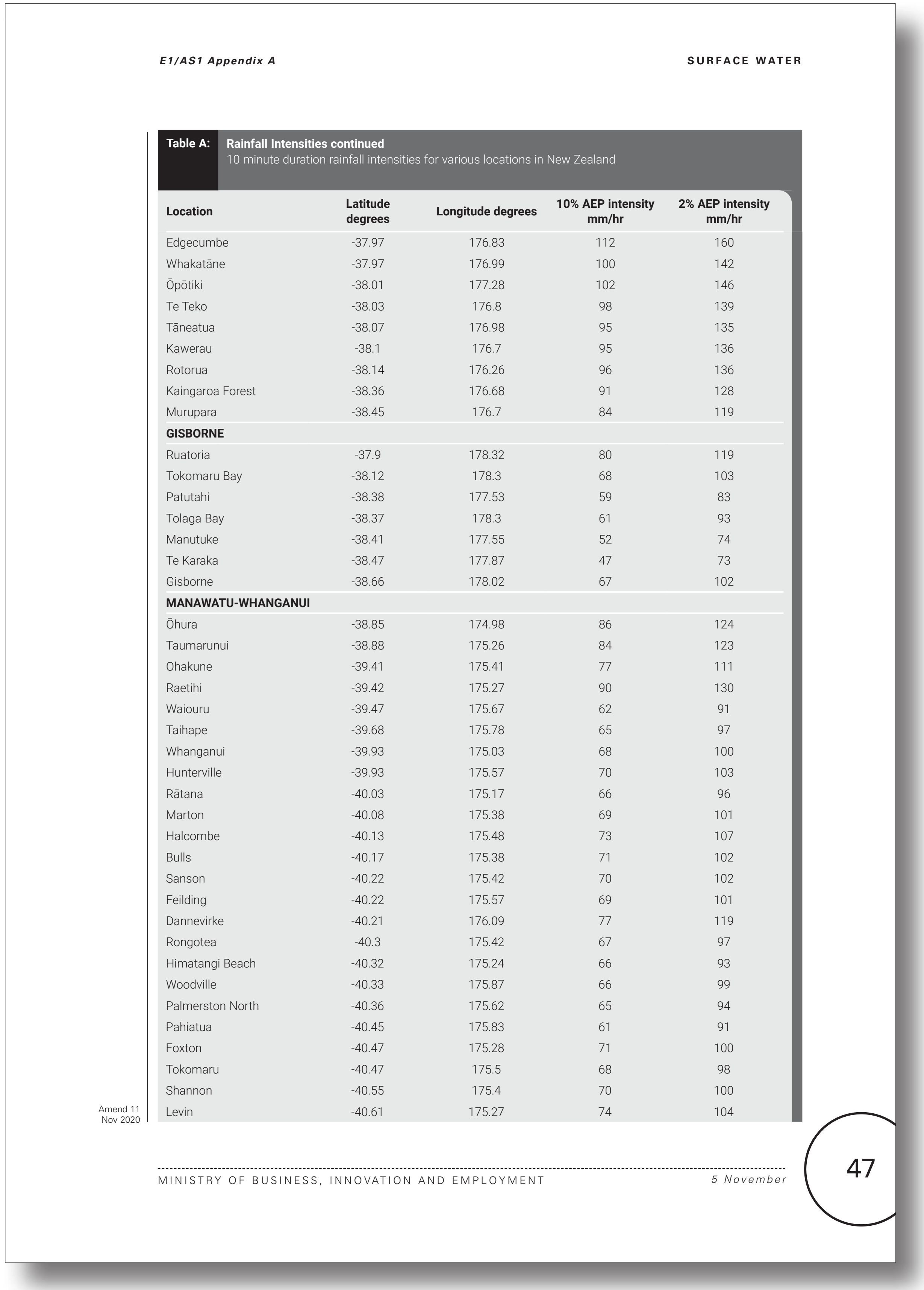
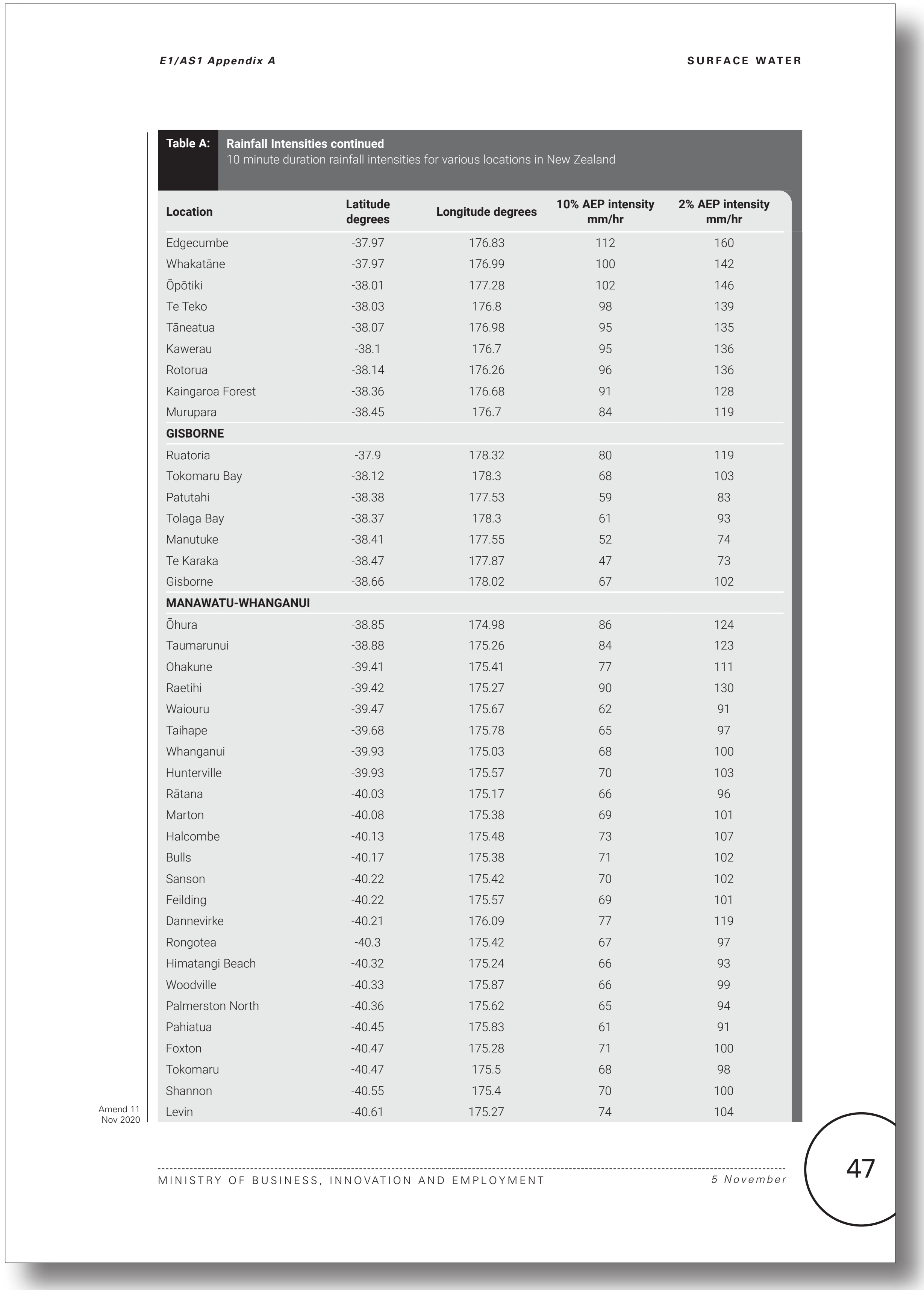


Table A: **Rainfall Intensities continued**
10 minute duration rainfall intensities for various locations in New Zealand

Location	Latitude degrees	Longitude degrees	10% AEP intensity mm/hr	2% AEP intensity mm/hr
Edgecumbe	-37.97	176.83	112	160
Whakatāne	-37.97	176.99	100	142
Ōpōtiki	-38.01	177.28	102	146
Te Teko	-38.03	176.8	98	139
Tāneatua	-38.07	176.98	95	135
Kawerau	-38.1	176.7	95	136
Rotorua	-38.14	176.26	96	136
Kaingaroa Forest	-38.36	176.68	91	128
Murupara	-38.45	176.7	84	119
GISBORNE				
Ruatoria	-37.9	178.32	80	119
Tokomaru Bay	-38.12	178.3	68	103
Patutahi	-38.38	177.53	59	83
Tolaga Bay	-38.37	178.3	61	93
Manutuke	-38.41	177.55	52	74
Te Karaka	-38.47	177.87	47	73
Gisborne	-38.66	178.02	67	102
MANAWATU-WHANGANUI				
Ōhura	-38.85	174.98	86	124
Taumarunui	-38.88	175.26	84	123
Ohakune	-39.41	175.41	77	111
Raetihi	-39.42	175.27	90	130
Waiouru	-39.47	175.67	62	91
Taihape	-39.68	175.78	65	97
Whanganui	-39.93	175.03	68	100
Hunterville	-39.93	175.57	70	103
Rātana	-40.03	175.17	66	96
Marton	-40.08	175.38	69	101
Halcombe	-40.13	175.48	73	107
Bulls	-40.17	175.38	71	102
Sanson	-40.22	175.42	70	102
Feilding	-40.22	175.57	69	101
Dannevirke	-40.21	176.09	77	119
Rongotea	-40.3	175.42	67	97
Himatangi Beach	-40.32	175.24	66	93
Woodville	-40.33	175.87	66	99
Palmerston North	-40.36	175.62	65	94
Pahiatua	-40.45	175.83	61	91
Foxton	-40.47	175.28	71	100
Tokomaru	-40.47	175.5	68	98
Shannon	-40.55	175.4	70	100
Levin	-40.61	175.27	74	104

Amend 11
Nov 2020

Proposed E1 Surface Water - No changes proposed to this page



E1/AS1 Appendix A SURFACE WATER

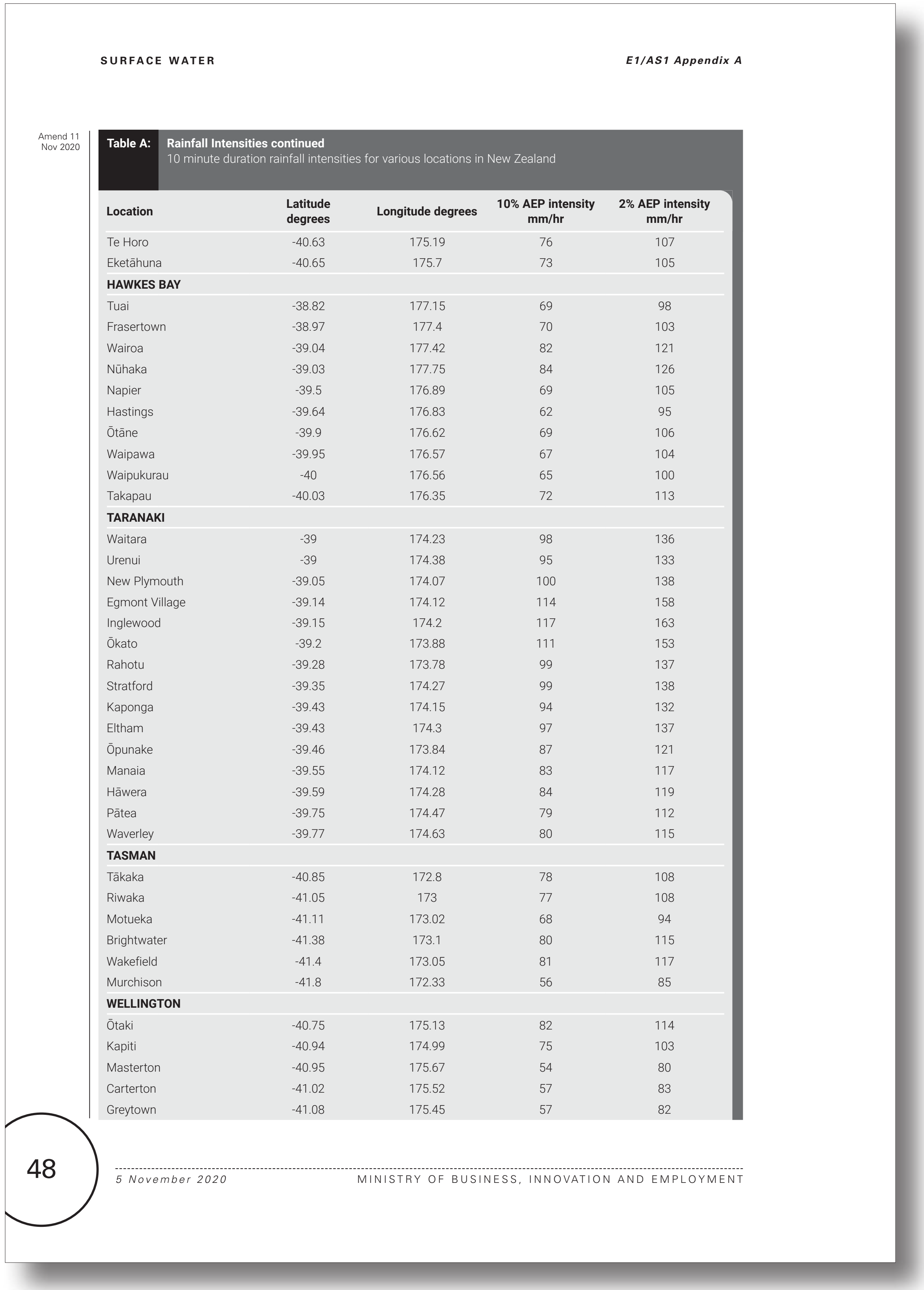
Table A: **Rainfall Intensities continued**
10 minute duration rainfall intensities for various locations in New Zealand

Location	Latitude degrees	Longitude degrees	10% AEP intensity mm/hr	2% AEP intensity mm/hr
Edgecumbe	-37.97	176.83	112	160
Whakatāne	-37.97	176.99	100	142
Ōpōtiki	-38.01	177.28	102	146
Te Teko	-38.03	176.8	98	139
Tāneatua	-38.07	176.98	95	135
Kawerau	-38.1	176.7	95	136
Rotorua	-38.14	176.26	96	136
Kaingaroa Forest	-38.36	176.68	91	128
Murupara	-38.45	176.7	84	119
GISBORNE				
Ruatoria	-37.9	178.32	80	119
Tokomaru Bay	-38.12	178.3	68	103
Patutahi	-38.38	177.53	59	83
Tolaga Bay	-38.37	178.3	61	93
Manutuke	-38.41	177.55	52	74
Te Karaka	-38.47	177.87	47	73
Gisborne	-38.66	178.02	67	102
MANAWATU-WHANGANUI				
Ōhura	-38.85	174.98	86	124
Taumarunui	-38.88	175.26	84	123
Ohakune	-39.41	175.41	77	111
Raetihi	-39.42	175.27	90	130
Waiouru	-39.47	175.67	62	91
Taihape	-39.68	175.78	65	97
Whanganui	-39.93	175.03	68	100
Hunterville	-39.93	175.57	70	103
Rātana	-40.03	175.17	66	96
Marton	-40.08	175.38	69	101
Halcombe	-40.13	175.48	73	107
Bulls	-40.17	175.38	71	102
Sanson	-40.22	175.42	70	102
Feilding	-40.22	175.57	69	101
Dannevirke	-40.21	176.09	77	119
Rongotea	-40.3	175.42	67	97
Himatangi Beach	-40.32	175.24	66	93
Woodville	-40.33	175.87	66	99
Palmerston North	-40.36	175.62	65	94
Pahiatua	-40.45	175.83	61	91
Foxton	-40.47	175.28	71	100
Tokomaru	-40.47	175.5	68	98
Shannon	-40.55	175.4	70	100
Levin	-40.61	175.27	74	104

Amend 11
Nov 2020

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT *5 November* 47

Current E1 Surface Water - No changes proposed to this page

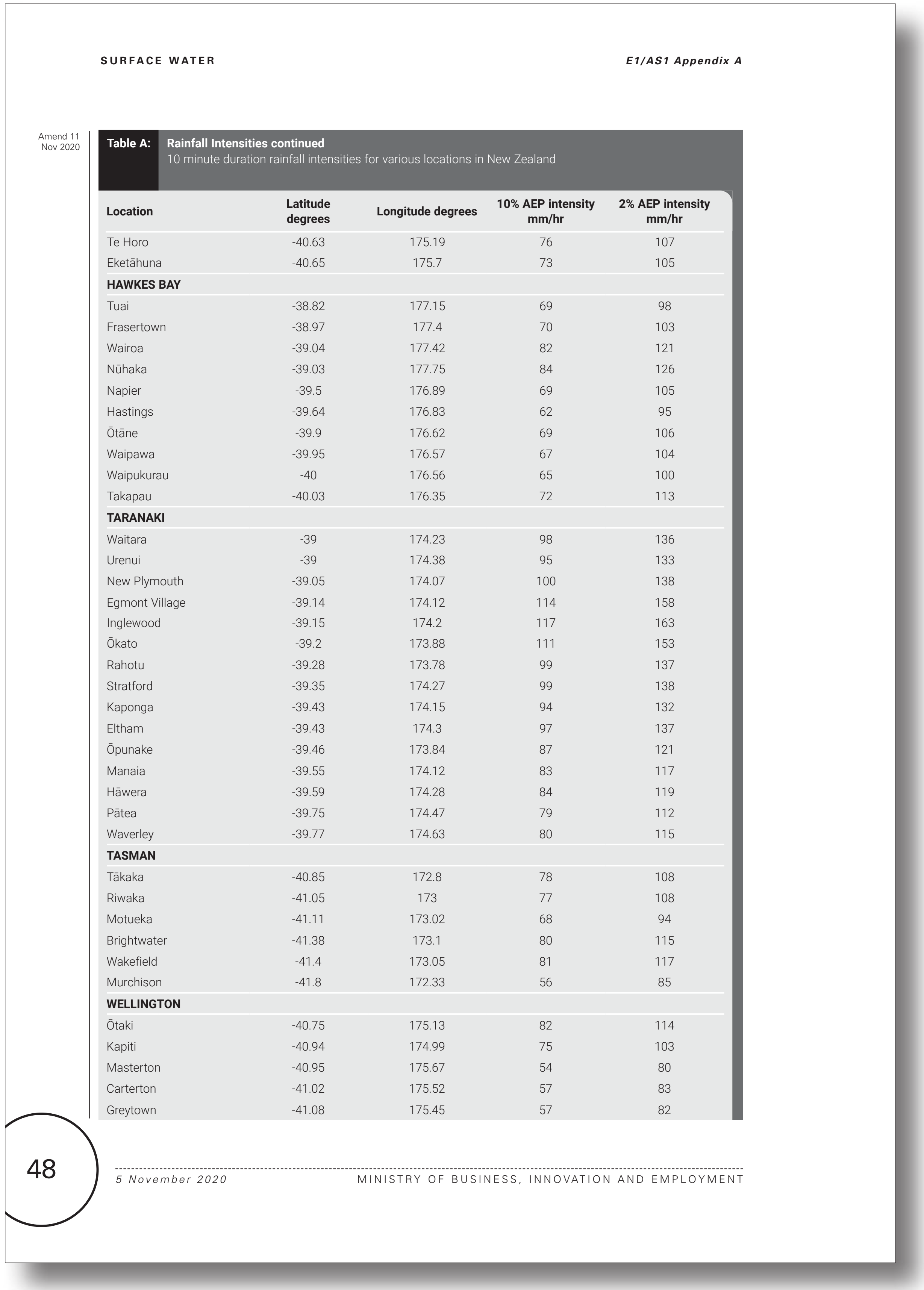


Amend 11 Nov 2020

Table A: **Rainfall Intensities continued**
10 minute duration rainfall intensities for various locations in New Zealand

Location	Latitude degrees	Longitude degrees	10% AEP intensity mm/hr	2% AEP intensity mm/hr
Te Horo	-40.63	175.19	76	107
Eketāhuna	-40.65	175.7	73	105
HAWKES BAY				
Tuai	-38.82	177.15	69	98
Frasertown	-38.97	177.4	70	103
Wairoa	-39.04	177.42	82	121
Nūhaka	-39.03	177.75	84	126
Napier	-39.5	176.89	69	105
Hastings	-39.64	176.83	62	95
Ōtāne	-39.9	176.62	69	106
Waipawa	-39.95	176.57	67	104
Waipukurau	-40	176.56	65	100
Takapau	-40.03	176.35	72	113
TARANAKI				
Waitara	-39	174.23	98	136
Urenui	-39	174.38	95	133
New Plymouth	-39.05	174.07	100	138
Egmont Village	-39.14	174.12	114	158
Inglewood	-39.15	174.2	117	163
Ōkato	-39.2	173.88	111	153
Rahotu	-39.28	173.78	99	137
Stratford	-39.35	174.27	99	138
Kaponga	-39.43	174.15	94	132
Eltham	-39.43	174.3	97	137
Ōpunake	-39.46	173.84	87	121
Manaia	-39.55	174.12	83	117
Hāwera	-39.59	174.28	84	119
Pātea	-39.75	174.47	79	112
Waverley	-39.77	174.63	80	115
TASMAN				
Tākaka	-40.85	172.8	78	108
Riwaka	-41.05	173	77	108
Motueka	-41.11	173.02	68	94
Brightwater	-41.38	173.1	80	115
Wakefield	-41.4	173.05	81	117
Murchison	-41.8	172.33	56	85
WELLINGTON				
Ōtaki	-40.75	175.13	82	114
Kapiti	-40.94	174.99	75	103
Masterton	-40.95	175.67	54	80
Carterton	-41.02	175.52	57	83
Greytown	-41.08	175.45	57	82

Proposed E1 Surface Water - No changes proposed to this page



SURFACE WATER E1/AS1 Appendix A

Amend 11 Nov 2020

Table A: **Rainfall Intensities continued**
10 minute duration rainfall intensities for various locations in New Zealand

Location	Latitude degrees	Longitude degrees	10% AEP intensity mm/hr	2% AEP intensity mm/hr
Te Horo	-40.63	175.19	76	107
Eketāhuna	-40.65	175.7	73	105
HAWKES BAY				
Tuai	-38.82	177.15	69	98
Frasertown	-38.97	177.4	70	103
Wairoa	-39.04	177.42	82	121
Nūhaka	-39.03	177.75	84	126
Napier	-39.5	176.89	69	105
Hastings	-39.64	176.83	62	95
Ōtāne	-39.9	176.62	69	106
Waipawa	-39.95	176.57	67	104
Waipukurau	-40	176.56	65	100
Takapau	-40.03	176.35	72	113
TARANAKI				
Waitara	-39	174.23	98	136
Urenui	-39	174.38	95	133
New Plymouth	-39.05	174.07	100	138
Egmont Village	-39.14	174.12	114	158
Inglewood	-39.15	174.2	117	163
Ōkato	-39.2	173.88	111	153
Rahotu	-39.28	173.78	99	137
Stratford	-39.35	174.27	99	138
Kaponga	-39.43	174.15	94	132
Eltham	-39.43	174.3	97	137
Ōpunake	-39.46	173.84	87	121
Manaia	-39.55	174.12	83	117
Hāwera	-39.59	174.28	84	119
Pātea	-39.75	174.47	79	112
Waverley	-39.77	174.63	80	115
TASMAN				
Tākaka	-40.85	172.8	78	108
Riwaka	-41.05	173	77	108
Motueka	-41.11	173.02	68	94
Brightwater	-41.38	173.1	80	115
Wakefield	-41.4	173.05	81	117
Murchison	-41.8	172.33	56	85
WELLINGTON				
Ōtaki	-40.75	175.13	82	114
Kapiti	-40.94	174.99	75	103
Masterton	-40.95	175.67	54	80
Carterton	-41.02	175.52	57	83
Greytown	-41.08	175.45	57	82

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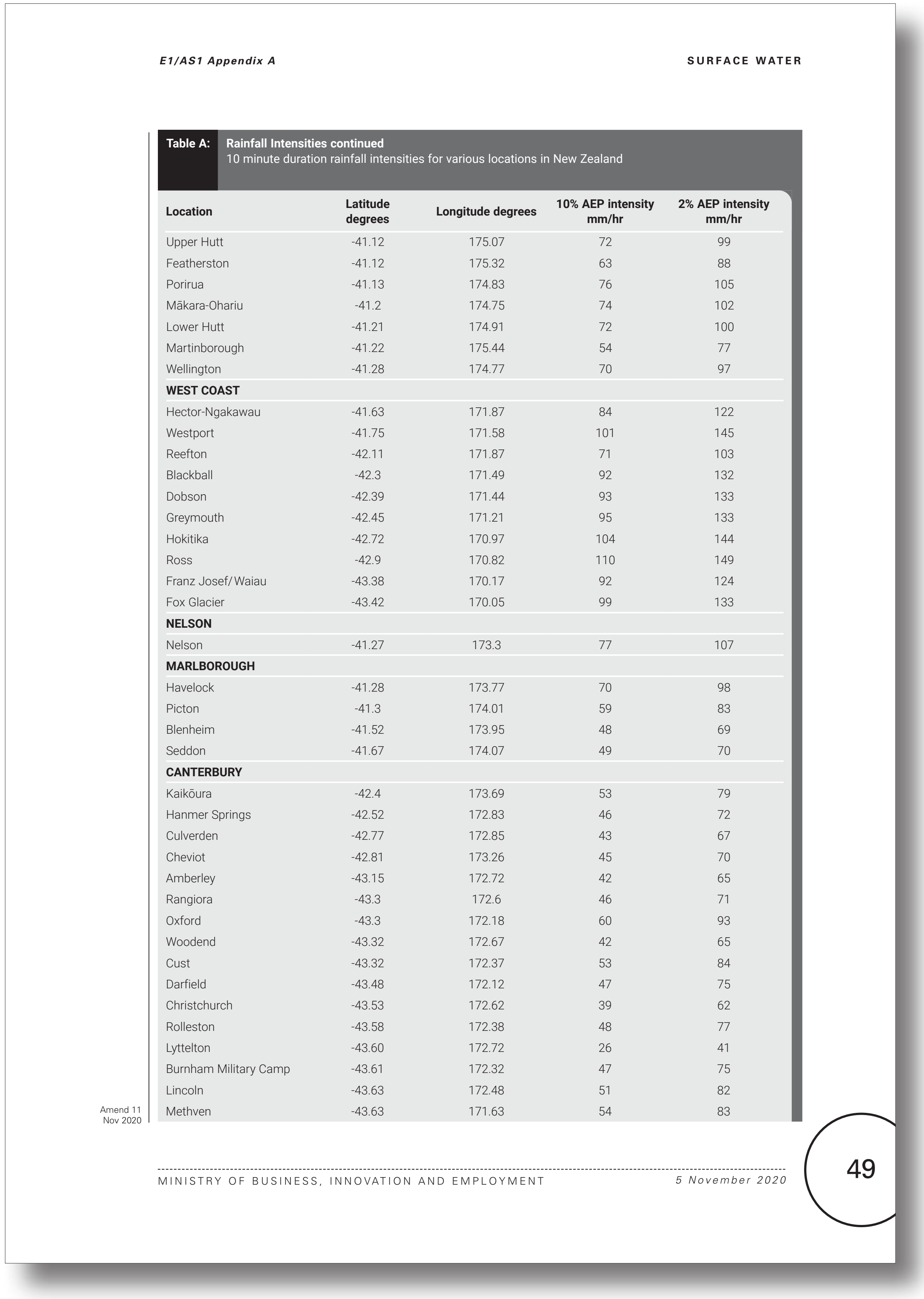

Table A: **Rainfall Intensities continued**
10 minute duration rainfall intensities for various locations in New Zealand

Location	Latitude degrees	Longitude degrees	10% AEP intensity mm/hr	2% AEP intensity mm/hr
Upper Hutt	-41.12	175.07	72	99
Featherston	-41.12	175.32	63	88
Porirua	-41.13	174.83	76	105
Mākara-Ohariu	-41.2	174.75	74	102
Lower Hutt	-41.21	174.91	72	100
Martinborough	-41.22	175.44	54	77
Wellington	-41.28	174.77	70	97
WEST COAST				
Hector-Ngakawau	-41.63	171.87	84	122
Westport	-41.75	171.58	101	145
Reefton	-42.11	171.87	71	103
Blackball	-42.3	171.49	92	132
Dobson	-42.39	171.44	93	133
Greymouth	-42.45	171.21	95	133
Hokitika	-42.72	170.97	104	144
Ross	-42.9	170.82	110	149
Franz Josef/Waiau	-43.38	170.17	92	124
Fox Glacier	-43.42	170.05	99	133
NELSON				
Nelson	-41.27	173.3	77	107
MARLBOROUGH				
Havelock	-41.28	173.77	70	98
Picton	-41.3	174.01	59	83
Blenheim	-41.52	173.95	48	69
Seddon	-41.67	174.07	49	70
CANTERBURY				
Kaikōura	-42.4	173.69	53	79
Hanmer Springs	-42.52	172.83	46	72
Culverden	-42.77	172.85	43	67
Cheviot	-42.81	173.26	45	70
Amberley	-43.15	172.72	42	65
Rangiora	-43.3	172.6	46	71
Oxford	-43.3	172.18	60	93
Woodend	-43.32	172.67	42	65
Cust	-43.32	172.37	53	84
Darfield	-43.48	172.12	47	75
Christchurch	-43.53	172.62	39	62
Rolleston	-43.58	172.38	48	77
Lyttelton	-43.60	172.72	26	41
Burnham Military Camp	-43.61	172.32	47	75
Lincoln	-43.63	172.48	51	82
Methven	-43.63	171.63	54	83

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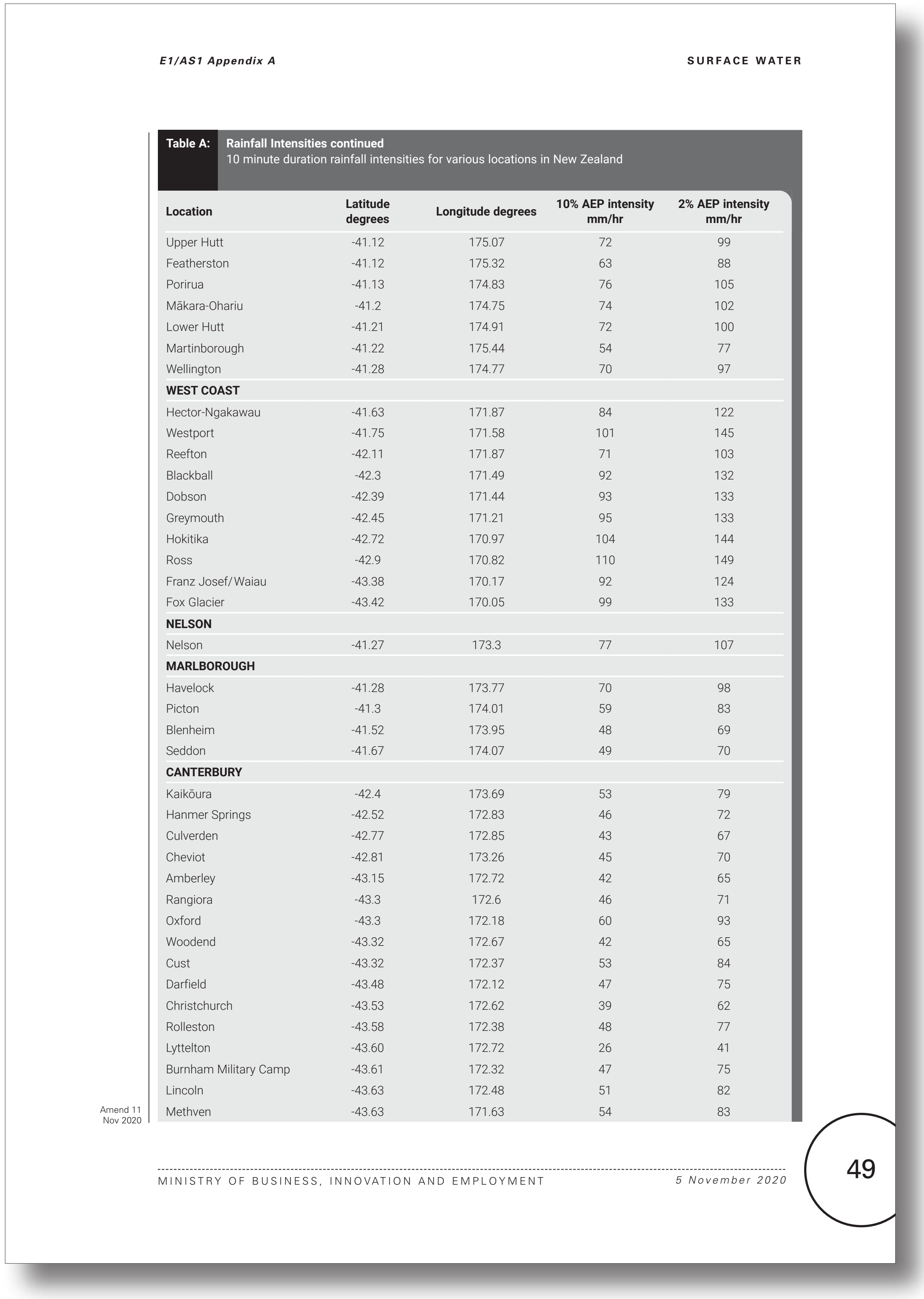
Proposed E1 Surface Water - No changes proposed to this page



E1/AS1 Appendix A SURFACE WATER

Table A: **Rainfall Intensities continued**
10 minute duration rainfall intensities for various locations in New Zealand

Location	Latitude degrees	Longitude degrees	10% AEP intensity mm/hr	2% AEP intensity mm/hr
Upper Hutt	-41.12	175.07	72	99
Featherston	-41.12	175.32	63	88
Porirua	-41.13	174.83	76	105
Mākara-Ohariu	-41.2	174.75	74	102
Lower Hutt	-41.21	174.91	72	100
Martinborough	-41.22	175.44	54	77
Wellington	-41.28	174.77	70	97
WEST COAST				
Hector-Ngakawau	-41.63	171.87	84	122
Westport	-41.75	171.58	101	145
Reefton	-42.11	171.87	71	103
Blackball	-42.3	171.49	92	132
Dobson	-42.39	171.44	93	133
Greymouth	-42.45	171.21	95	133
Hokitika	-42.72	170.97	104	144
Ross	-42.9	170.82	110	149
Franz Josef/Waiau	-43.38	170.17	92	124
Fox Glacier	-43.42	170.05	99	133
NELSON				
Nelson	-41.27	173.3	77	107
MARLBOROUGH				
Havelock	-41.28	173.77	70	98
Picton	-41.3	174.01	59	83
Blenheim	-41.52	173.95	48	69
Seddon	-41.67	174.07	49	70
CANTERBURY				
Kaikōura	-42.4	173.69	53	79
Hanmer Springs	-42.52	172.83	46	72
Culverden	-42.77	172.85	43	67
Cheviot	-42.81	173.26	45	70
Amberley	-43.15	172.72	42	65
Rangiora	-43.3	172.6	46	71
Oxford	-43.3	172.18	60	93
Woodend	-43.32	172.67	42	65
Cust	-43.32	172.37	53	84
Darfield	-43.48	172.12	47	75
Christchurch	-43.53	172.62	39	62
Rolleston	-43.58	172.38	48	77
Lyttelton	-43.60	172.72	26	41
Burnham Military Camp	-43.61	172.32	47	75
Lincoln	-43.63	172.48	51	82
Methven	-43.63	171.63	54	83

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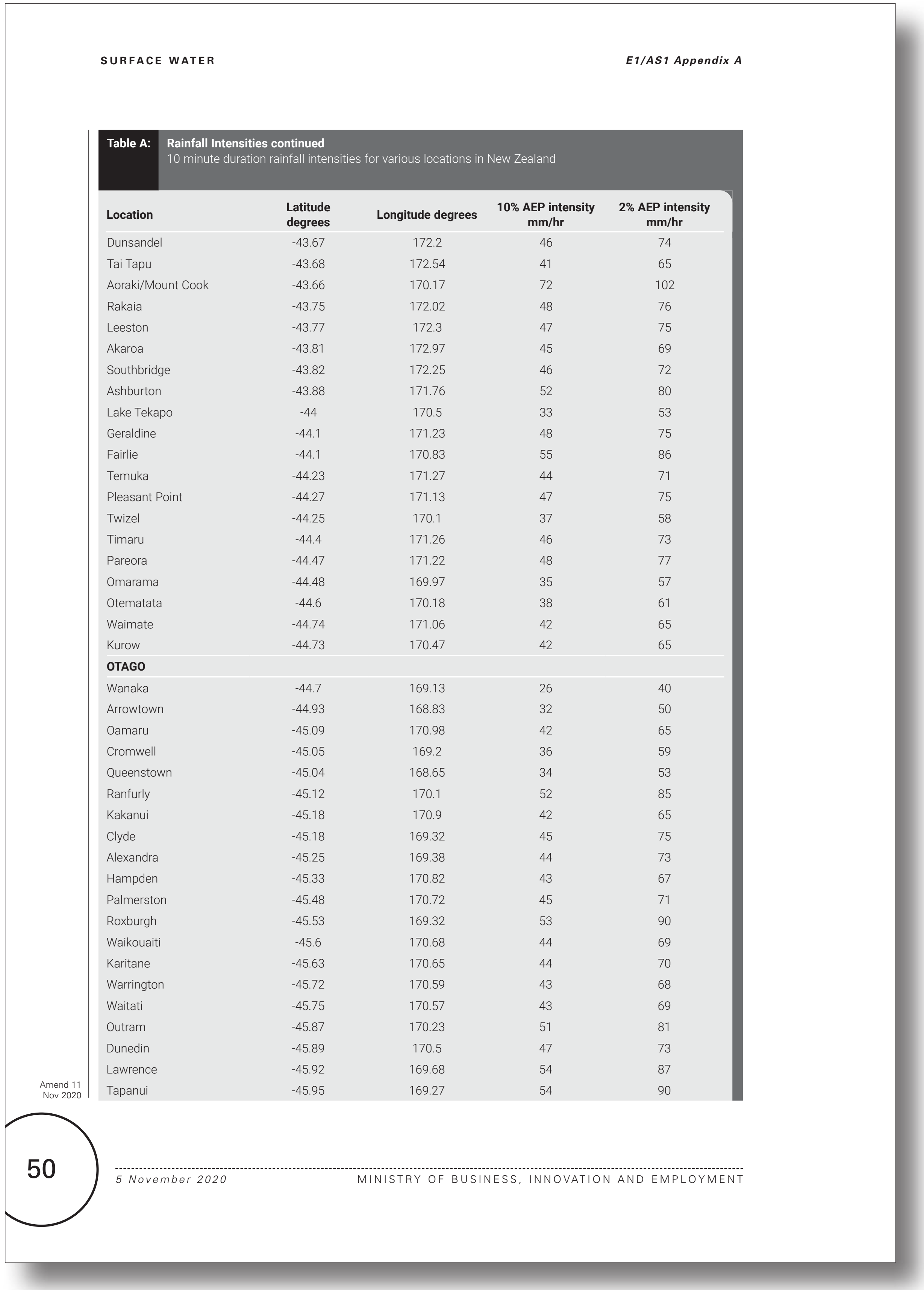

Table A: **Rainfall Intensities continued**
10 minute duration rainfall intensities for various locations in New Zealand

Location	Latitude degrees	Longitude degrees	10% AEP intensity mm/hr	2% AEP intensity mm/hr
Dunsandel	-43.67	172.2	46	74
Tai Tapu	-43.68	172.54	41	65
Aoraki/Mount Cook	-43.66	170.17	72	102
Rakaia	-43.75	172.02	48	76
Leeston	-43.77	172.3	47	75
Akaroa	-43.81	172.97	45	69
Southbridge	-43.82	172.25	46	72
Ashburton	-43.88	171.76	52	80
Lake Tekapo	-44	170.5	33	53
Geraldine	-44.1	171.23	48	75
Fairlie	-44.1	170.83	55	86
Temuka	-44.23	171.27	44	71
Pleasant Point	-44.27	171.13	47	75
Twizel	-44.25	170.1	37	58
Timaru	-44.4	171.26	46	73
Pareora	-44.47	171.22	48	77
Omarama	-44.48	169.97	35	57
Otematata	-44.6	170.18	38	61
Waimate	-44.74	171.06	42	65
Kurow	-44.73	170.47	42	65
OTAGO				
Wanaka	-44.7	169.13	26	40
Arrowtown	-44.93	168.83	32	50
Oamaru	-45.09	170.98	42	65
Cromwell	-45.05	169.2	36	59
Queenstown	-45.04	168.65	34	53
Ranfurly	-45.12	170.1	52	85
Kakanui	-45.18	170.9	42	65
Clyde	-45.18	169.32	45	75
Alexandra	-45.25	169.38	44	73
Hampden	-45.33	170.82	43	67
Palmerston	-45.48	170.72	45	71
Roxburgh	-45.53	169.32	53	90
Waikouaiti	-45.6	170.68	44	69
Karitane	-45.63	170.65	44	70
Warrington	-45.72	170.59	43	68
Waitati	-45.75	170.57	43	69
Outram	-45.87	170.23	51	81
Dunedin	-45.89	170.5	47	73
Lawrence	-45.92	169.68	54	87
Tapanui	-45.95	169.27	54	90

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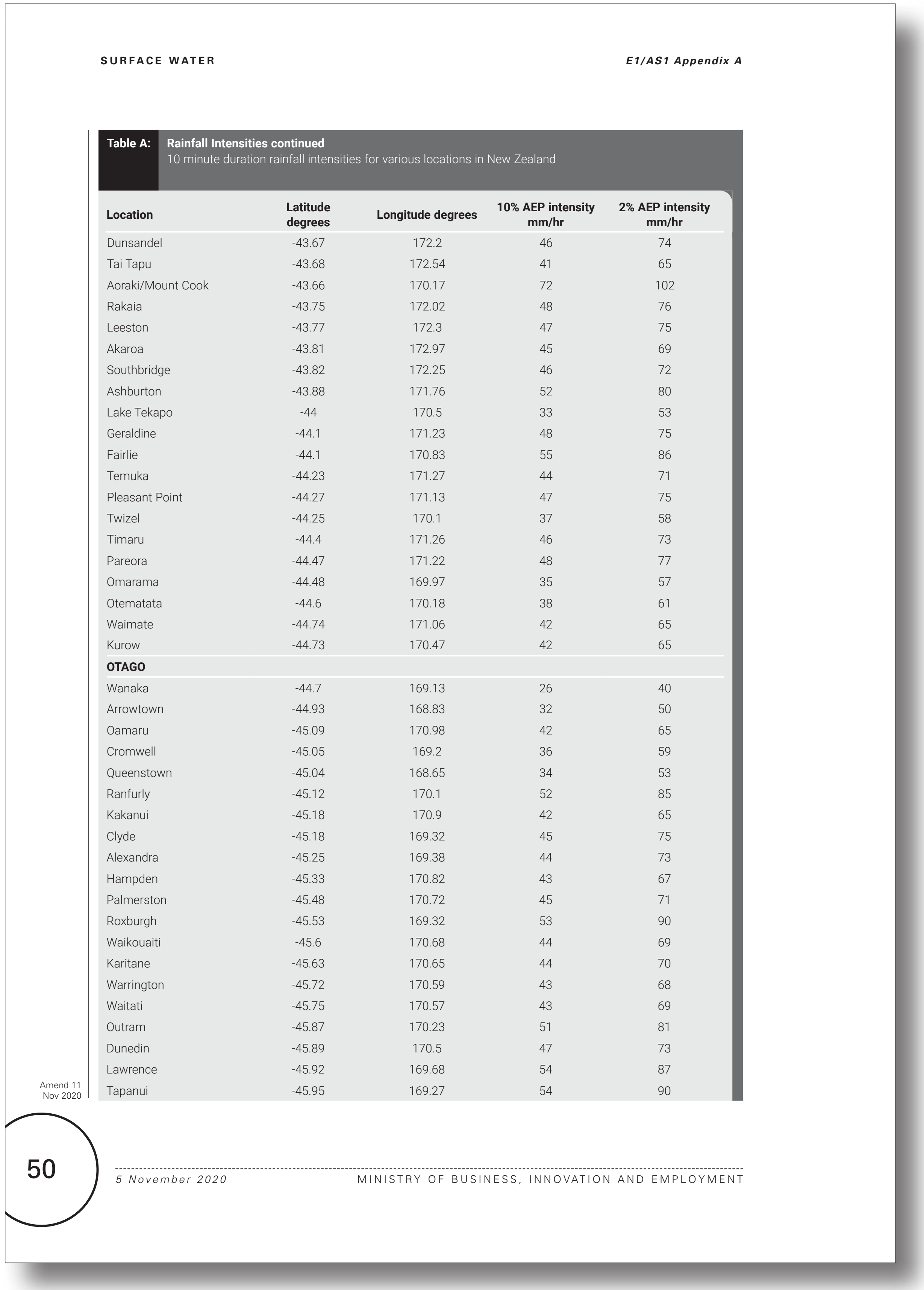
Proposed E1 Surface Water - No changes proposed to this page



SURFACE WATER E1/AS1 Appendix A

Table A: **Rainfall Intensities continued**
10 minute duration rainfall intensities for various locations in New Zealand

Location	Latitude degrees	Longitude degrees	10% AEP intensity mm/hr	2% AEP intensity mm/hr
Dunsandel	-43.67	172.2	46	74
Tai Tapu	-43.68	172.54	41	65
Aoraki/Mount Cook	-43.66	170.17	72	102
Rakaia	-43.75	172.02	48	76
Leeston	-43.77	172.3	47	75
Akaroa	-43.81	172.97	45	69
Southbridge	-43.82	172.25	46	72
Ashburton	-43.88	171.76	52	80
Lake Tekapo	-44	170.5	33	53
Geraldine	-44.1	171.23	48	75
Fairlie	-44.1	170.83	55	86
Temuka	-44.23	171.27	44	71
Pleasant Point	-44.27	171.13	47	75
Twizel	-44.25	170.1	37	58
Timaru	-44.4	171.26	46	73
Pareora	-44.47	171.22	48	77
Omarama	-44.48	169.97	35	57
Otematata	-44.6	170.18	38	61
Waimate	-44.74	171.06	42	65
Kurow	-44.73	170.47	42	65
OTAGO				
Wanaka	-44.7	169.13	26	40
Arrowtown	-44.93	168.83	32	50
Oamaru	-45.09	170.98	42	65
Cromwell	-45.05	169.2	36	59
Queenstown	-45.04	168.65	34	53
Ranfurly	-45.12	170.1	52	85
Kakanui	-45.18	170.9	42	65
Clyde	-45.18	169.32	45	75
Alexandra	-45.25	169.38	44	73
Hampden	-45.33	170.82	43	67
Palmerston	-45.48	170.72	45	71
Roxburgh	-45.53	169.32	53	90
Waikouaiti	-45.6	170.68	44	69
Karitane	-45.63	170.65	44	70
Warrington	-45.72	170.59	43	68
Waitati	-45.75	170.57	43	69
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Dunedin	-45.89	170.5	47	73
Lawrence	-45.92	169.68	54	87
Tapanui	-45.95	169.27	54	90

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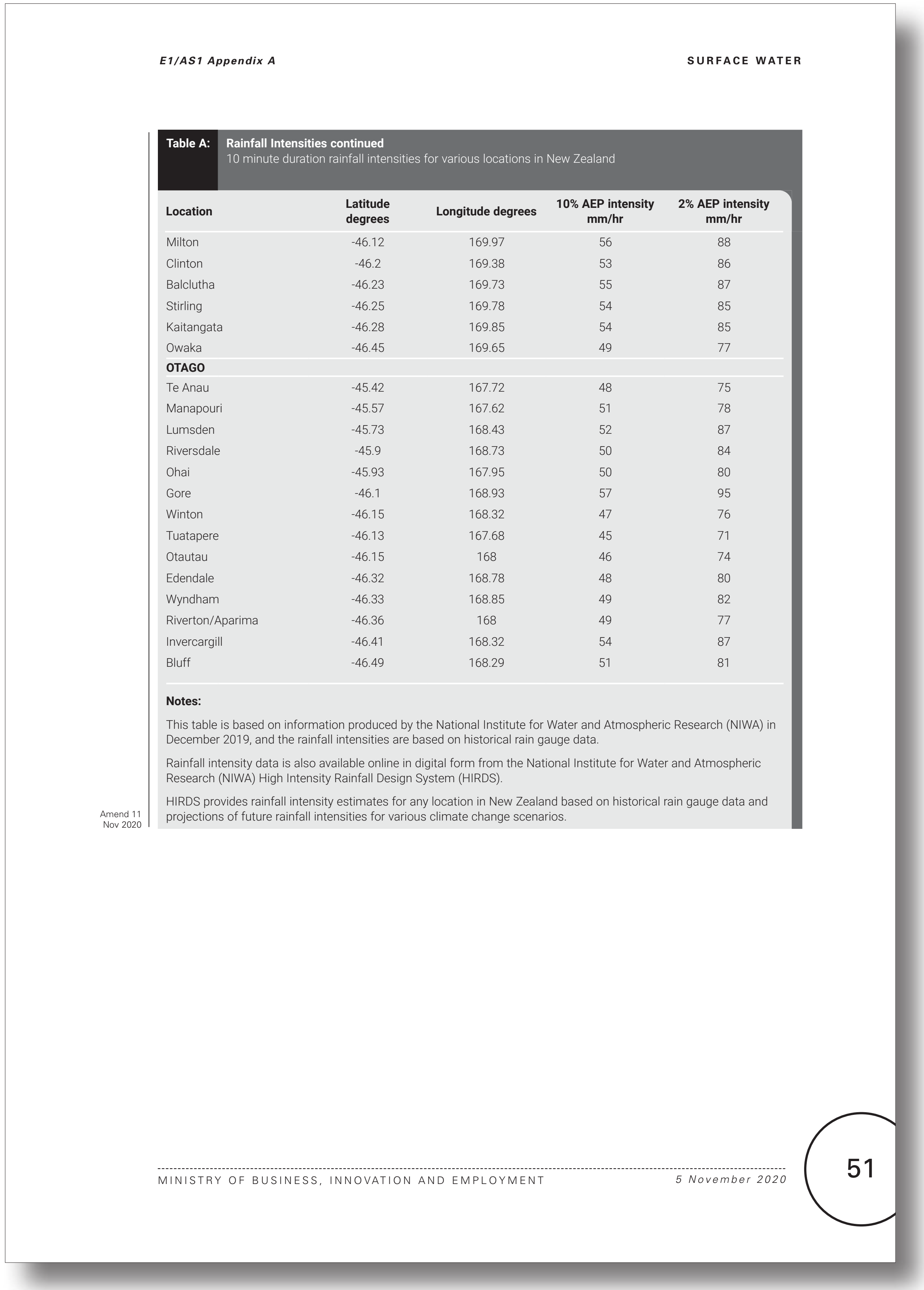
Current E1 Surface Water - No changes proposed to this page



E1/AS1 Appendix A SURFACE WATER

Table A: Rainfall Intensities continued
10 minute duration rainfall intensities for various locations in New Zealand

Location	Latitude degrees	Longitude degrees	10% AEP intensity mm/hr	2% AEP intensity mm/hr
Milton	-46.12	169.97	56	88
Clinton	-46.2	169.38	53	86
Balclutha	-46.23	169.73	55	87
Stirling	-46.25	169.78	54	85
Kaitangata	-46.28	169.85	54	85
Owaka	-46.45	169.65	49	77
OTAGO				
Te Anau	-45.42	167.72	48	75
Manapouri	-45.57	167.62	51	78
Lumsden	-45.73	168.43	52	87
Riversdale	-45.9	168.73	50	84
Ohai	-45.93	167.95	50	80
Gore	-46.1	168.93	57	95
Winton	-46.15	168.32	47	76
Tuatapere	-46.13	167.68	45	71
Otautau	-46.15	168	46	74
Edendale	-46.32	168.78	48	80
Wyndham	-46.33	168.85	49	82
Riverton/Aparima	-46.36	168	49	77
Invercargill	-46.41	168.32	54	87
Bluff	-46.49	168.29	51	81

Notes:

This table is based on information produced by the National Institute for Water and Atmospheric Research (NIWA) in December 2019, and the rainfall intensities are based on historical rain gauge data.

Rainfall intensity data is also available online in digital form from the National Institute for Water and Atmospheric Research (NIWA) High Intensity Rainfall Design System (HIRDS).

HIRDS provides rainfall intensity estimates for any location in New Zealand based on historical rain gauge data and projections of future rainfall intensities for various climate change scenarios.

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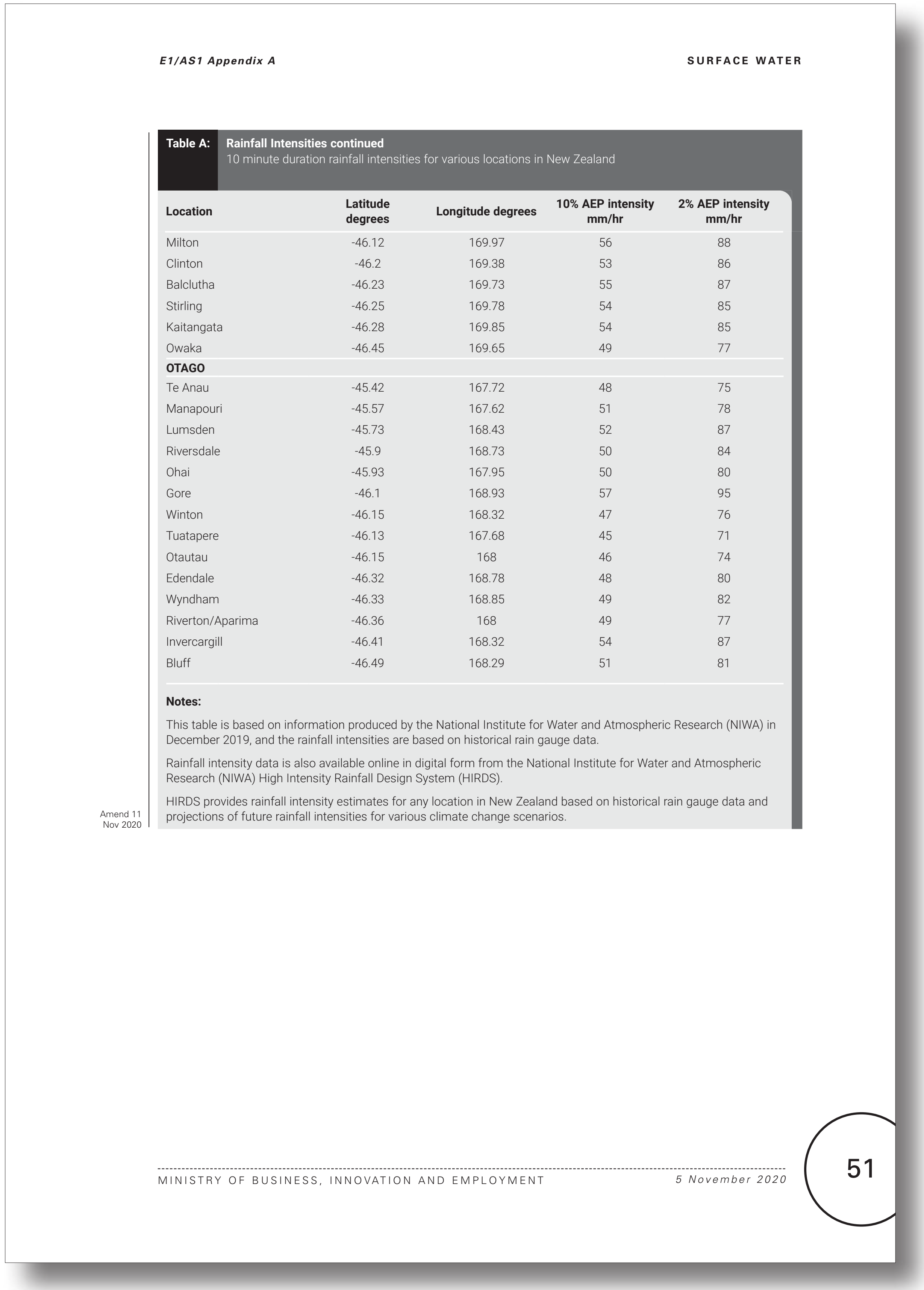
Proposed E1 Surface Water - No changes proposed to this page



E1/AS1 Appendix A SURFACE WATER

Table A: Rainfall Intensities continued
10 minute duration rainfall intensities for various locations in New Zealand

Location	Latitude degrees	Longitude degrees	10% AEP intensity mm/hr	2% AEP intensity mm/hr
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Stirling	-46.25	169.78	54	85
Kaitangata	-46.28	169.85	54	85
Owaka	-46.45	169.65	49	77
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Lumsden	-45.73	168.43	52	87
Riversdale	-45.9	168.73	50	84
Ohai	-45.93	167.95	50	80
Gore	-46.1	168.93	57	95
Winton	-46.15	168.32	47	76
Tuatapere	-46.13	167.68	45	71
Otautau	-46.15	168	46	74
Edendale	-46.32	168.78	48	80
Wyndham	-46.33	168.85	49	82
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Invercargill	-46.41	168.32	54	87
Bluff	-46.49	168.29	51	81

Notes:

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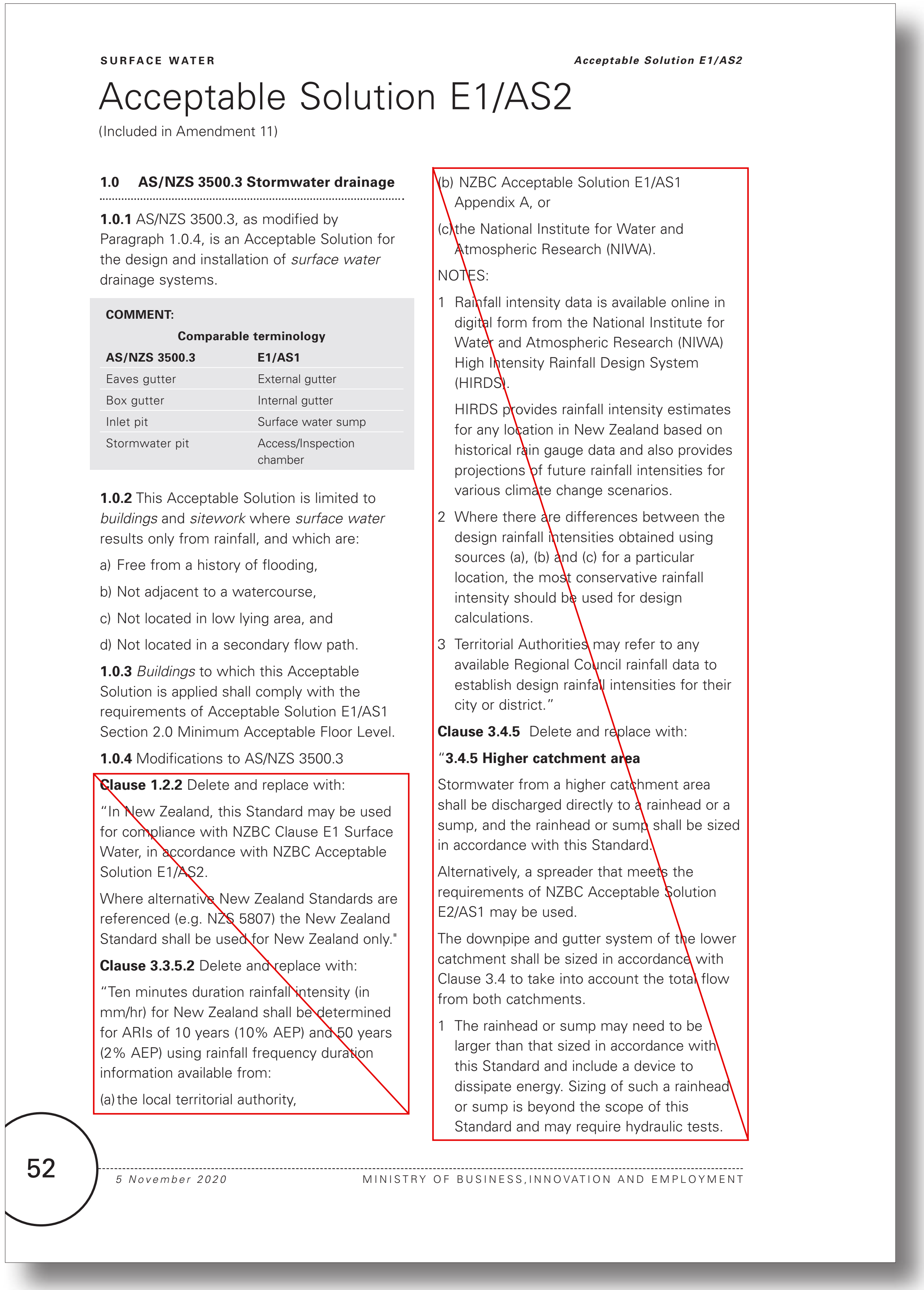
Appendix A. Proposed changes to the acceptable solutions and verification methods for clause E1 Surface Water

Current E1 Surface Water acceptable solutions and verification methods

(Text to be amended shown in red)



Acceptable Solution E1/AS2

(Included in Amendment 11)

1.0 AS/NZS 3500.3 Stormwater drainage

1.0.1 AS/NZS 3500.3, as modified by Paragraph 1.0.4, is an Acceptable Solution for the design and installation of *surface water* drainage systems.

COMMENT:

Comparable terminology

AS/NZS 3500.3	**E1/AS1**
Eaves gutter	External gutter
Box gutter	Internal gutter
Inlet pit	Surface water sump
Stormwater pit	Access/Inspection chamber

1.0.2 This Acceptable Solution is limited to *buildings* and *sitework* where *surface water* results only from rainfall, and which are:

a) Free from a history of flooding,

b) Not adjacent to a watercourse,

c) Not located in low lying area, and

d) Not located in a secondary flow path.

1.0.3 *Buildings* to which this Acceptable Solution is applied shall comply with the requirements of Acceptable Solution E1/AS1 Section 2.0 Minimum Acceptable Floor Level.

1.0.4 Modifications to AS/NZS 3500.3

~~**Clause 1.2.2** Delete and replace with:~~

~~"In New Zealand, this Standard may be used for compliance with NZBC Clause E1 Surface Water, in accordance with NZBC Acceptable Solution E1/AS2.~~

~~Where alternative New Zealand Standards are referenced (e.g. NZS 5807) the New Zealand Standard shall be used for New Zealand only."~~

~~**Clause 3.3.5.2** Delete and replace with:~~

~~"Ten minutes duration rainfall intensity (in mm/hr) for New Zealand shall be determined for ARIs of 10 years (10% AEP) and 50 years (2% AEP) using rainfall frequency duration information available from:~~

~~(a) the local territorial authority,~~

~~(b) NZBC Acceptable Solution E1/AS1 Appendix A, or~~

~~(c) the National Institute for Water and Atmospheric Research (NIWA).~~

~~NOTES:~~

~~1 Rainfall intensity data is available online in digital form from the National Institute for Water and Atmospheric Research (NIWA) High Intensity Rainfall Design System (HIRDS).~~

~~HIRDS provides rainfall intensity estimates for any location in New Zealand based on historical rain gauge data and also provides projections of future rainfall intensities for various climate change scenarios.~~

~~2 Where there are differences between the design rainfall intensities obtained using sources (a), (b) and (c) for a particular location, the most conservative rainfall intensity should be used for design calculations.~~

~~3 Territorial Authorities may refer to any available Regional Council rainfall data to establish design rainfall intensities for their city or district."~~

~~**Clause 3.4.5** Delete and replace with:~~

~~"**3.4.5 Higher catchment area**~~

~~Stormwater from a higher catchment area shall be discharged directly to a rainhead or a sump, and the rainhead or sump shall be sized in accordance with this Standard.~~

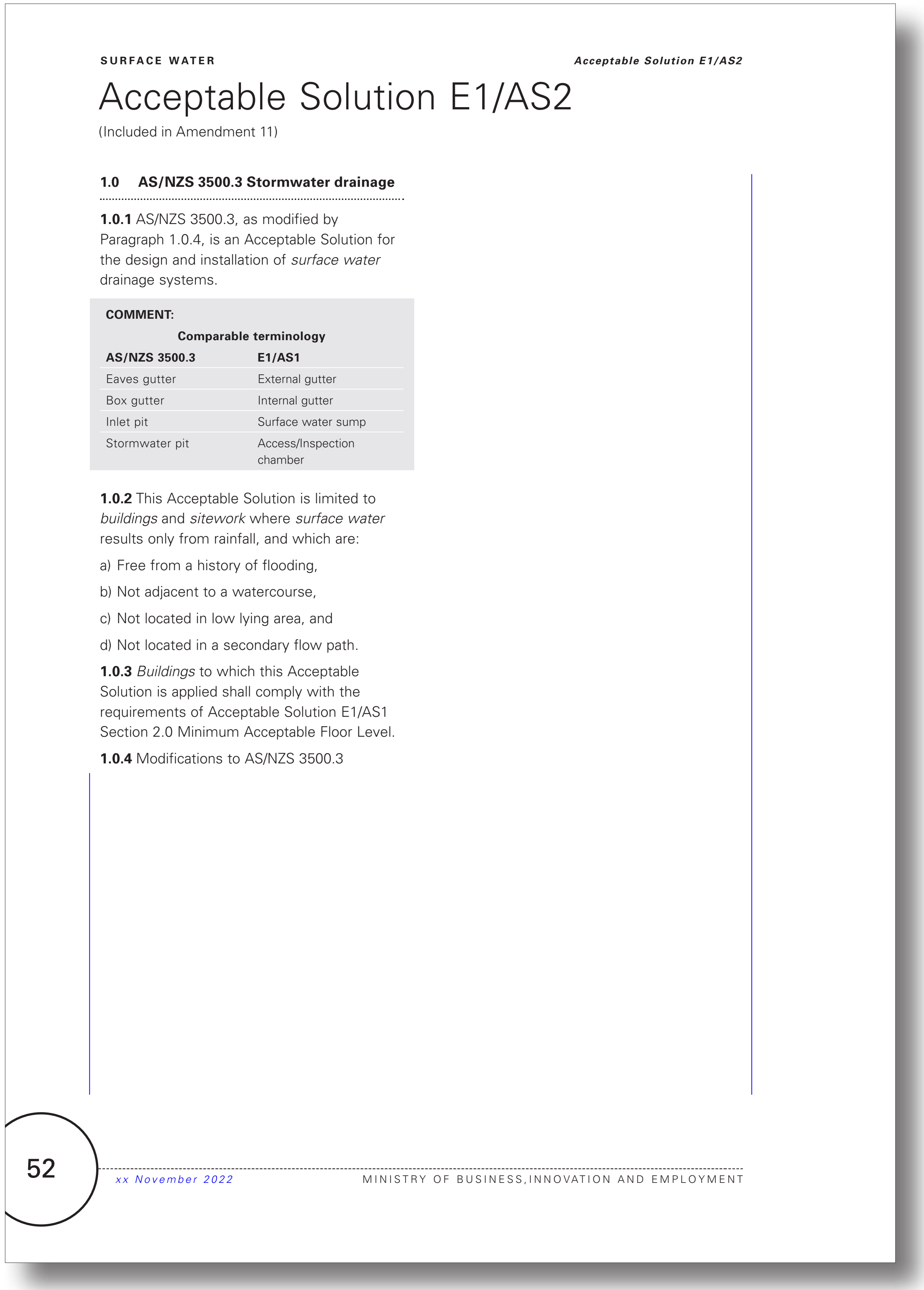
~~Alternatively, a spreader that meets the requirements of NZBC Acceptable Solution E2/AS1 may be used.~~

~~The downpipe and gutter system of the lower catchment shall be sized in accordance with Clause 3.4 to take into account the total flow from both catchments.~~

~~1 The rainhead or sump may need to be larger than that sized in accordance with this Standard and include a device to dissipate energy. Sizing of such a rainhead or sump is beyond the scope of this Standard and may require hydraulic tests.~~

Proposed amendments to E1 Surface Water acceptable solutions and verification methods

(Proposed text in blue)



Acceptable Solution E1/AS2

(Included in Amendment 11)

1.0 AS/NZS 3500.3 Stormwater drainage

1.0.1 AS/NZS 3500.3, as modified by Paragraph 1.0.4, is an Acceptable Solution for the design and installation of *surface water* drainage systems.

COMMENT:

Comparable terminology

AS/NZS 3500.3	**E1/AS1**
Eaves gutter	External gutter
Box gutter	Internal gutter
Inlet pit	Surface water sump
Stormwater pit	Access/Inspection chamber

1.0.2 This Acceptable Solution is limited to *buildings* and *sitework* where *surface water* results only from rainfall, and which are:

a) Free from a history of flooding,

b) Not adjacent to a watercourse,

c) Not located in low lying area, and

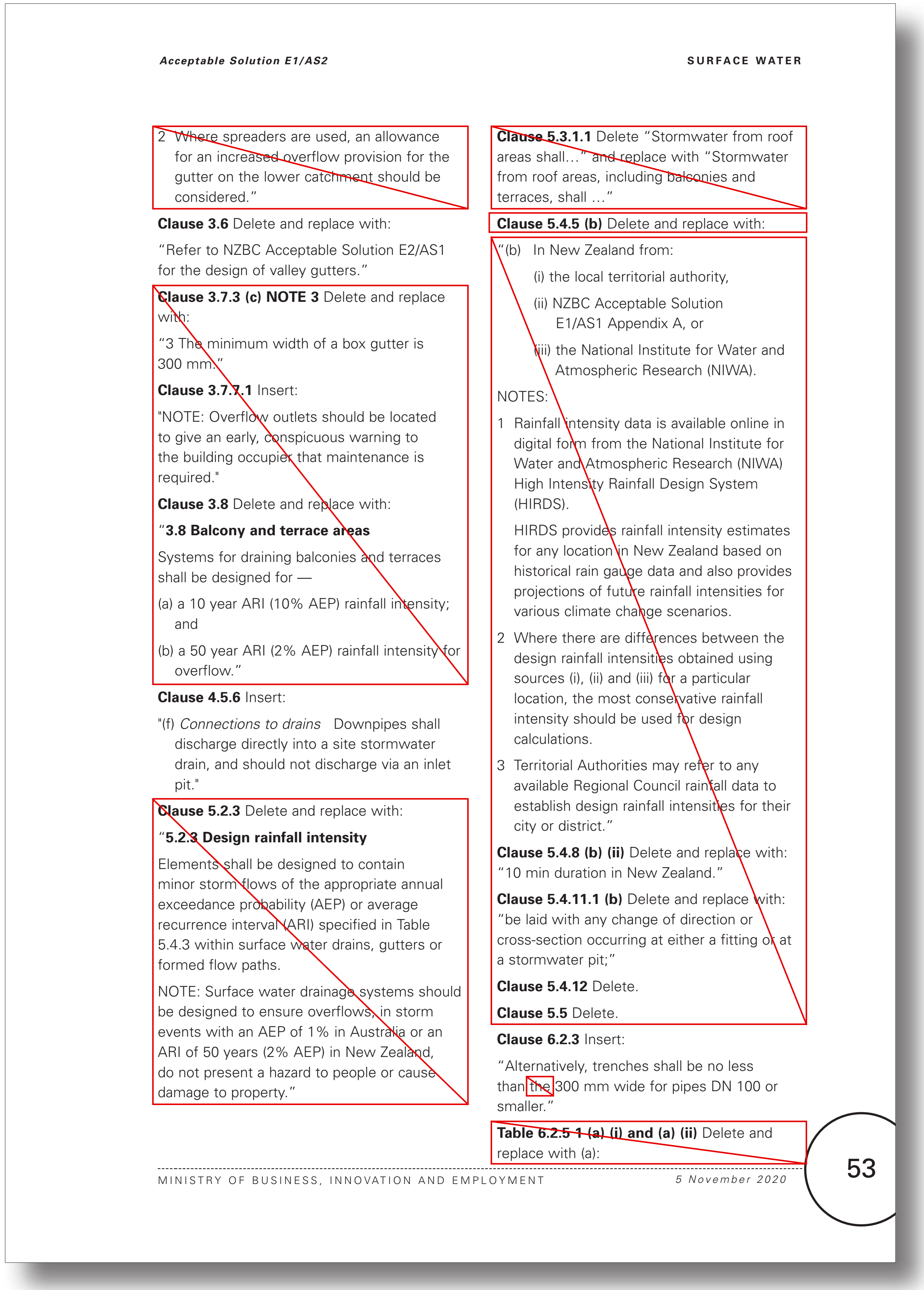
d) Not located in a secondary flow path.

1.0.3 *Buildings* to which this Acceptable Solution is applied shall comply with the requirements of Acceptable Solution E1/AS1 Section 2.0 Minimum Acceptable Floor Level.

1.0.4 Modifications to AS/NZS 3500.3

Current E1 Surface Water acceptable solutions and verification methods

(Text to be amended shown in red)



Acceptable Solution E1/AS2 SURFACE WATER

~~2 Where spreaders are used, an allowance for an increased overflow provision for the gutter on the lower catchment should be considered."~~

Clause 3.6 Delete and replace with:

"Refer to NZBC Acceptable Solution E2/AS1 for the design of valley gutters."

~~**Clause 3.7.3 (c) NOTE 3** Delete and replace with:~~

~~"3 The minimum width of a box gutter is 300 mm."~~

~~**Clause 3.7.7.1** Insert:~~

~~"NOTE: Overflow outlets should be located to give an early, conspicuous warning to the building occupier that maintenance is required."~~

~~**Clause 3.8** Delete and replace with:~~

~~"**3.8 Balcony and terrace areas**~~

~~Systems for draining balconies and terraces shall be designed for —~~

~~(a) a 10 year ARI (10% AEP) rainfall intensity; and~~

~~(b) a 50 year ARI (2% AEP) rainfall intensity for overflow."~~

Clause 4.5.6 Insert:

"(f) *Connections to drains* Downpipes shall discharge directly into a site stormwater drain, and should not discharge via an inlet pit."

~~**Clause 5.2.3** Delete and replace with:~~

~~"**5.2.3 Design rainfall intensity**~~

~~Elements shall be designed to contain minor storm flows of the appropriate annual exceedance probability (AEP) or average recurrence interval (ARI) specified in Table 5.4.3 within surface water drains, gutters or formed flow paths.~~

~~NOTE: Surface water drainage systems should be designed to ensure overflows, in storm events with an AEP of 1% in Australia or an ARI of 50 years (2% AEP) in New Zealand, do not present a hazard to people or cause damage to property."~~

~~**Clause 5.3.1.1** Delete "Stormwater from roof areas shall…" and replace with "Stormwater from roof areas, including balconies and terraces, shall …"~~

Clause 5.4.5 (b) Delete and replace with:

~~"(b) In New Zealand from:~~

~~(i) the local territorial authority,~~

~~(ii) NZBC Acceptable Solution E1/AS1 Appendix A, or~~

~~(iii) the National Institute for Water and Atmospheric Research (NIWA).~~

~~NOTES:~~

~~1 Rainfall intensity data is available online in digital form from the National Institute for Water and Atmospheric Research (NIWA) High Intensity Rainfall Design System (HIRDS).~~

~~HIRDS provides rainfall intensity estimates for any location in New Zealand based on historical rain gauge data and also provides projections of future rainfall intensities for various climate change scenarios.~~

~~2 Where there are differences between the design rainfall intensities obtained using sources (i), (ii) and (iii) for a particular location, the most conservative rainfall intensity should be used for design calculations.~~

~~3 Territorial Authorities may refer to any available Regional Council rainfall data to establish design rainfall intensities for their city or district."~~

~~**Clause 5.4.8 (b) (ii)** Delete and replace with: "10 min duration in New Zealand."~~

~~**Clause 5.4.11.1 (b)** Delete and replace with: "be laid with any change of direction or cross-section occurring at either a fitting or at a stormwater pit;"~~

~~**Clause 5.4.12** Delete.~~

~~**Clause 5.5** Delete.~~

Clause 6.2.3 Insert:

"Alternatively, trenches shall be no less than ~~the~~ 300 mm wide for pipes DN 100 or smaller."

~~**Table 6.2.5.1 (a) (i) and (a) (ii)** Delete and replace with (a):~~

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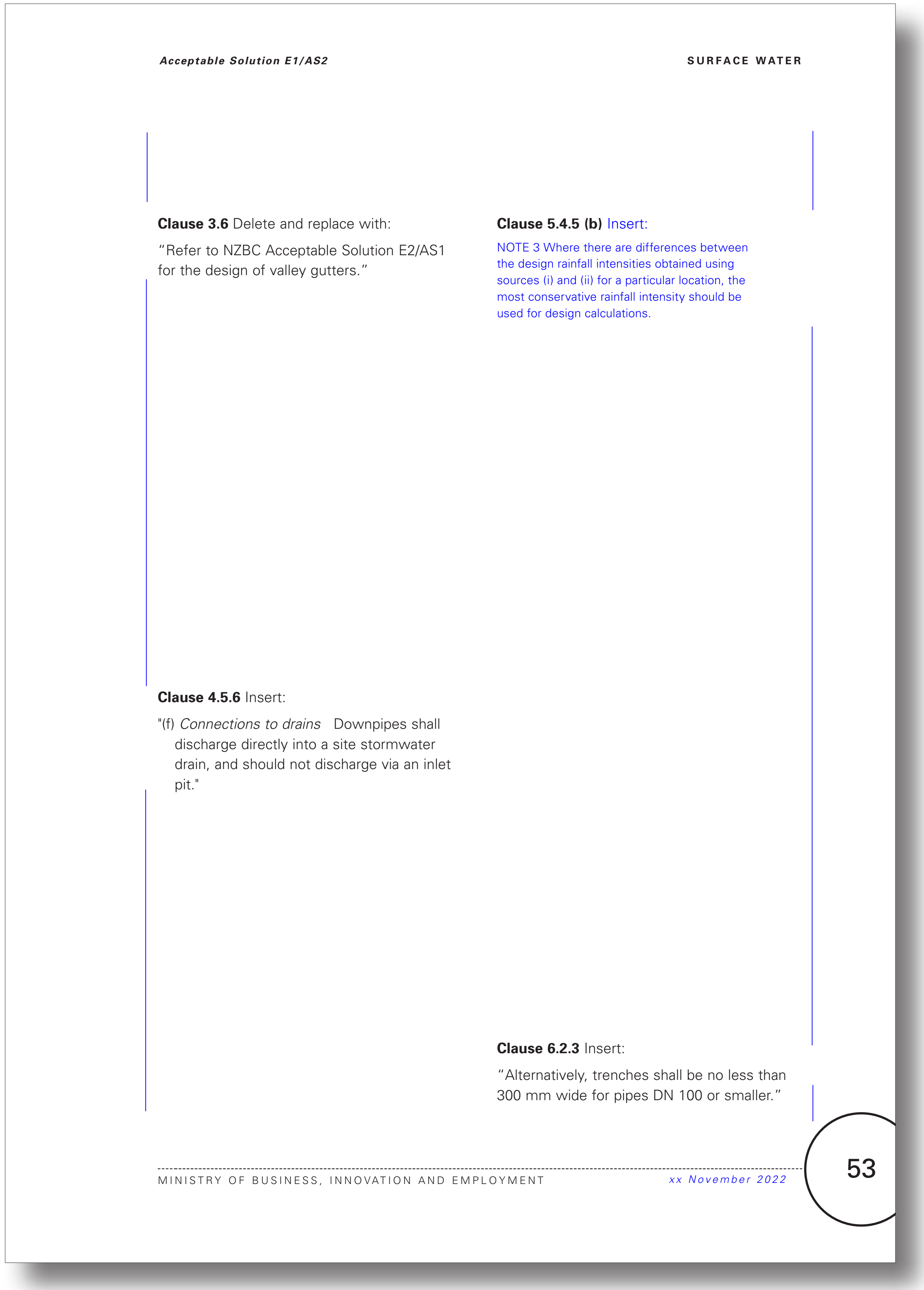
Proposed amendments to E1 Surface Water acceptable solutions and verification methods (Proposed text in blue)



Acceptable Solution E1/AS2 SURFACE WATER

Clause 3.6 Delete and replace with:

"Refer to NZBC Acceptable Solution E2/AS1 for the design of valley gutters."

Clause 4.5.6 Insert:

"(f) *Connections to drains* Downpipes shall discharge directly into a site stormwater drain, and should not discharge via an inlet pit."

Clause 5.4.5 (b) Insert:

NOTE 3 Where there are differences between the design rainfall intensities obtained using sources (i) and (ii) for a particular location, the most conservative rainfall intensity should be used for design calculations.

Clause 6.2.3 Insert:

"Alternatively, trenches shall be no less than 300 mm wide for pipes DN 100 or smaller."

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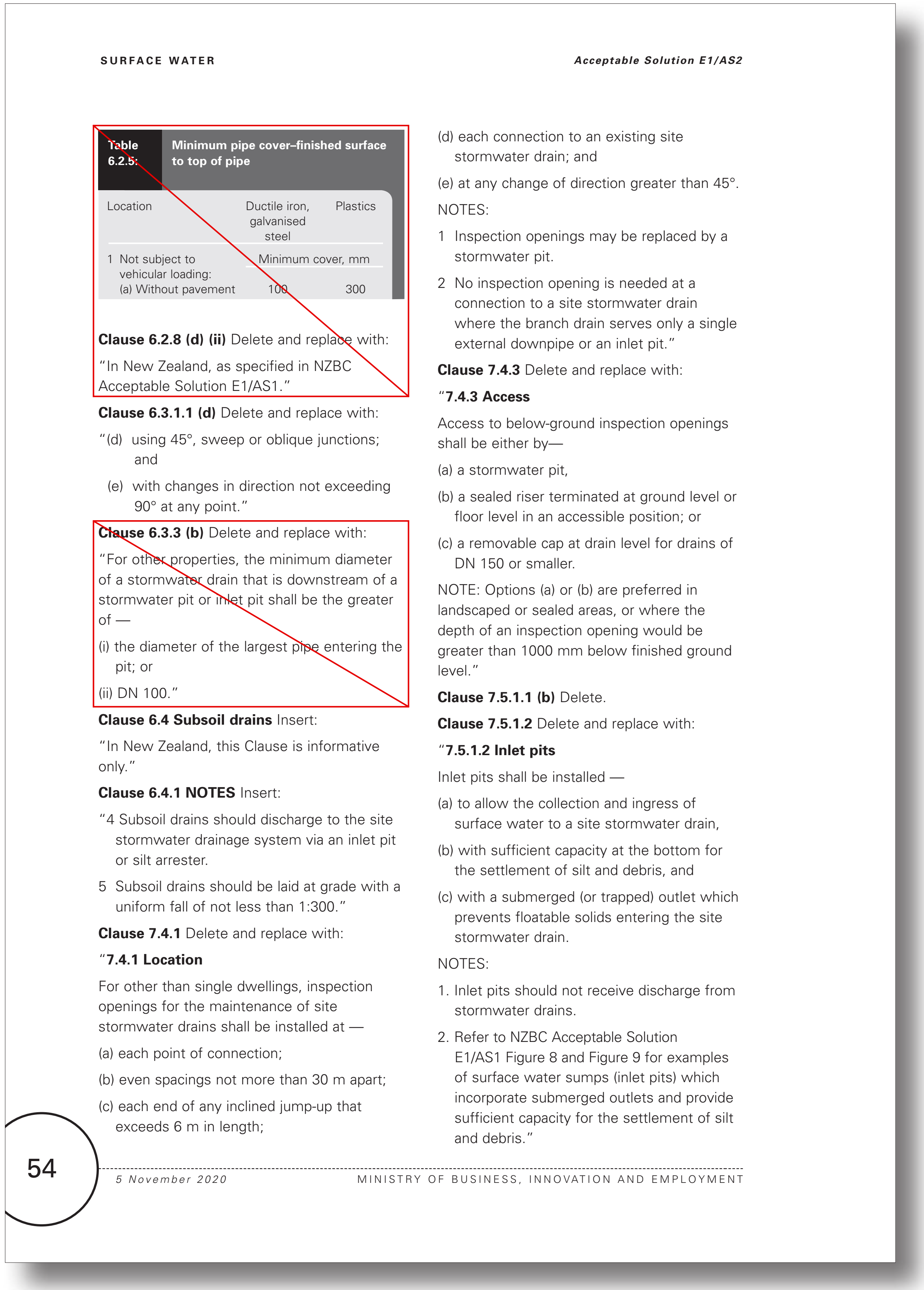
Current E1 Surface Water acceptable solutions and verification methods

(Text to be amended shown in red)



~~Table 6.2.5:~~	~~Minimum pipe cover–finished surface to top of pipe~~	
~~Location~~	~~Ductile iron, galvanised steel~~	~~Plastics~~
~~1 Not subject to vehicular loading:~~	~~Minimum cover, mm~~	
~~(a) Without pavement~~	~~100~~	~~300~~

~~**Clause 6.2.8 (d) (ii)** Delete and replace with:~~

~~"In New Zealand, as specified in NZBC Acceptable Solution E1/AS1."~~

Clause 6.3.1.1 (d) Delete and replace with:

"(d) using 45°, sweep or oblique junctions; and

(e) with changes in direction not exceeding 90° at any point."

~~**Clause 6.3.3 (b)** Delete and replace with:~~

~~"For other properties, the minimum diameter of a stormwater drain that is downstream of a stormwater pit or inlet pit shall be the greater of —~~

~~(i) the diameter of the largest pipe entering the pit; or~~

~~(ii) DN 100."~~

Clause 6.4 Subsoil drains Insert:

"In New Zealand, this Clause is informative only."

Clause 6.4.1 NOTES Insert:

"4 Subsoil drains should discharge to the site stormwater drainage system via an inlet pit or silt arrester.

5 Subsoil drains should be laid at grade with a uniform fall of not less than 1:300."

Clause 7.4.1 Delete and replace with:

"7.4.1 Location

For other than single dwellings, inspection openings for the maintenance of site stormwater drains shall be installed at —

(a) each point of connection;

(b) even spacings not more than 30 m apart;

(c) each end of any inclined jump-up that exceeds 6 m in length;

(d) each connection to an existing site stormwater drain; and

(e) at any change of direction greater than 45°.

NOTES:

1 Inspection openings may be replaced by a stormwater pit.

2 No inspection opening is needed at a connection to a site stormwater drain where the branch drain serves only a single external downpipe or an inlet pit."

Clause 7.4.3 Delete and replace with:

"7.4.3 Access

Access to below-ground inspection openings shall be either by—

(a) a stormwater pit,

(b) a sealed riser terminated at ground level or floor level in an accessible position; or

(c) a removable cap at drain level for drains of DN 150 or smaller.

NOTE: Options (a) or (b) are preferred in landscaped or sealed areas, or where the depth of an inspection opening would be greater than 1000 mm below finished ground level."

Clause 7.5.1.1 (b) Delete.

Clause 7.5.1.2 Delete and replace with:

"7.5.1.2 Inlet pits

Inlet pits shall be installed —

(a) to allow the collection and ingress of surface water to a site stormwater drain,

(b) with sufficient capacity at the bottom for the settlement of silt and debris, and

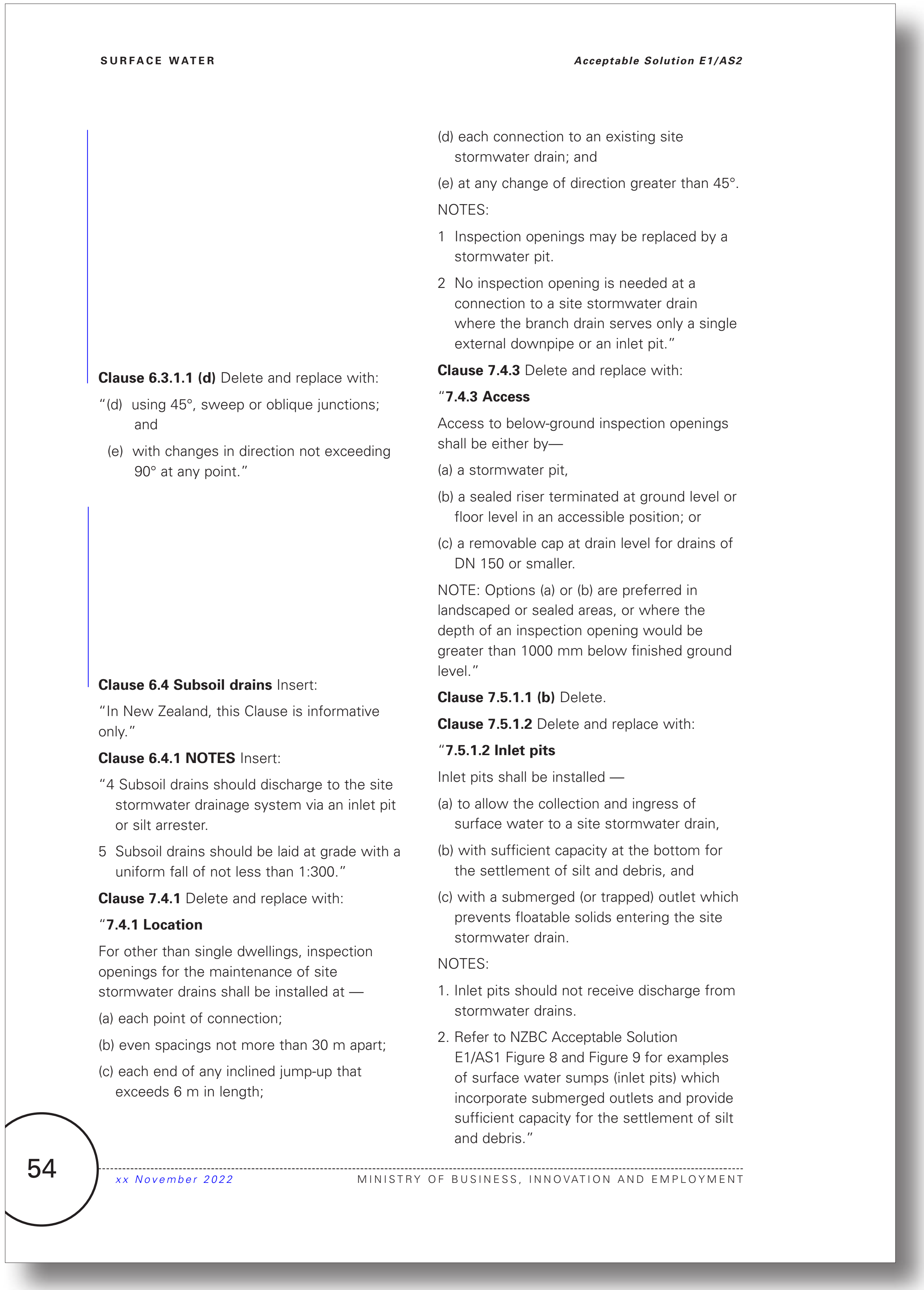
(c) with a submerged (or trapped) outlet which prevents floatable solids entering the site stormwater drain.

NOTES:

1. Inlet pits should not receive discharge from stormwater drains.

2. Refer to NZBC Acceptable Solution E1/AS1 Figure 8 and Figure 9 for examples of surface water sumps (inlet pits) which incorporate submerged outlets and provide sufficient capacity for the settlement of silt and debris."

Proposed amendments to E1 Surface Water acceptable solutions and verification methods (Proposed text in blue)



Clause 6.3.1.1 (d) Delete and replace with:

"(d) using 45°, sweep or oblique junctions; and

(e) with changes in direction not exceeding 90° at any point."

Clause 6.4 Subsoil drains Insert:

"In New Zealand, this Clause is informative only."

Clause 6.4.1 NOTES Insert:

"4 Subsoil drains should discharge to the site stormwater drainage system via an inlet pit or silt arrester.

5 Subsoil drains should be laid at grade with a uniform fall of not less than 1:300."

Clause 7.4.1 Delete and replace with:

"7.4.1 Location

For other than single dwellings, inspection openings for the maintenance of site stormwater drains shall be installed at —

(a) each point of connection;

(b) even spacings not more than 30 m apart;

(c) each end of any inclined jump-up that exceeds 6 m in length;

(d) each connection to an existing site stormwater drain; and

(e) at any change of direction greater than 45°.

NOTES:

1 Inspection openings may be replaced by a stormwater pit.

2 No inspection opening is needed at a connection to a site stormwater drain where the branch drain serves only a single external downpipe or an inlet pit."

Clause 7.4.3 Delete and replace with:

"7.4.3 Access

Access to below-ground inspection openings shall be either by—

(a) a stormwater pit,

(b) a sealed riser terminated at ground level or floor level in an accessible position; or

(c) a removable cap at drain level for drains of DN 150 or smaller.

NOTE: Options (a) or (b) are preferred in landscaped or sealed areas, or where the depth of an inspection opening would be greater than 1000 mm below finished ground level."

Clause 7.5.1.1 (b) Delete.

Clause 7.5.1.2 Delete and replace with:

"7.5.1.2 Inlet pits

Inlet pits shall be installed —

(a) to allow the collection and ingress of surface water to a site stormwater drain,

(b) with sufficient capacity at the bottom for the settlement of silt and debris, and

(c) with a submerged (or trapped) outlet which prevents floatable solids entering the site stormwater drain.

NOTES:

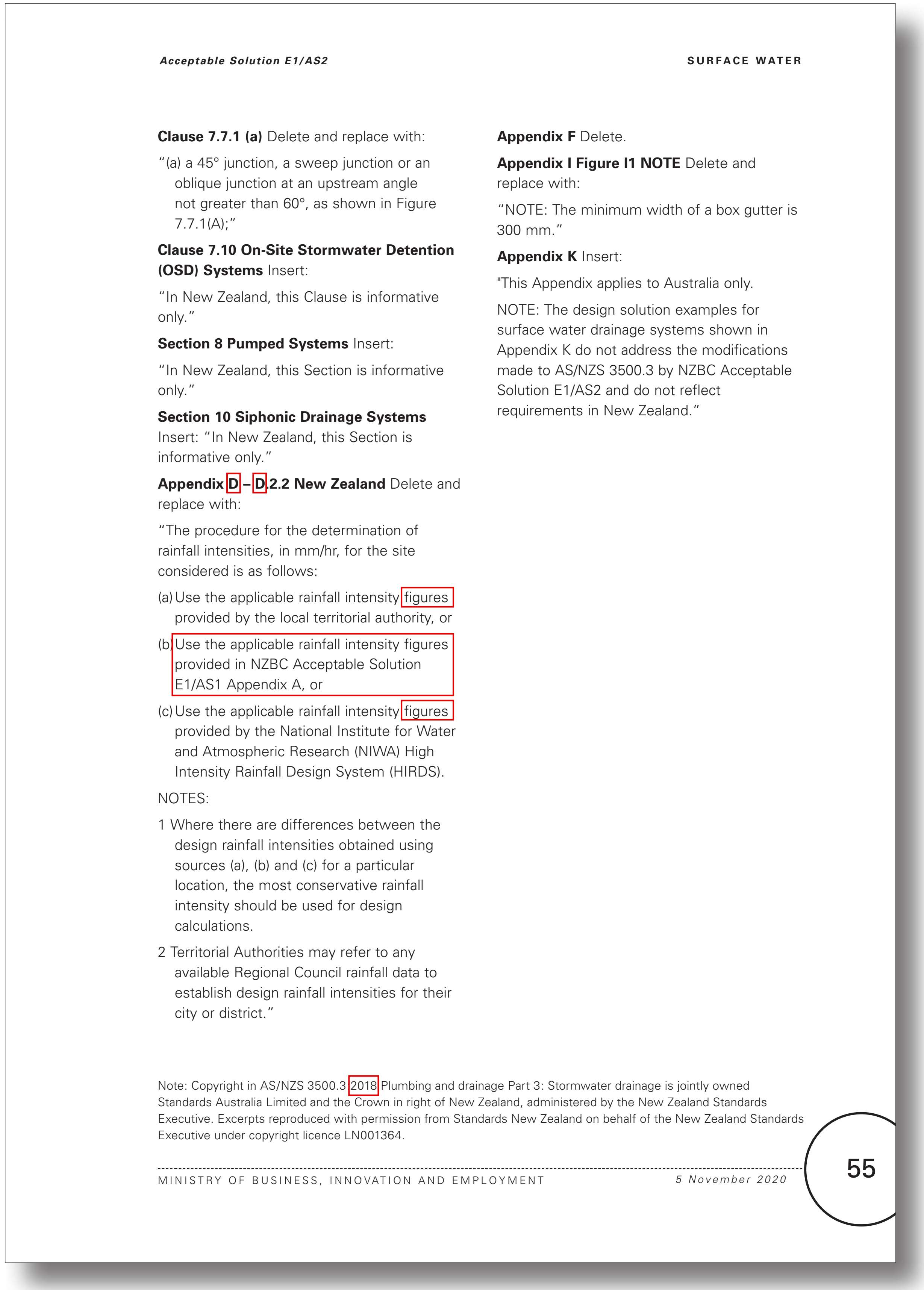
1. Inlet pits should not receive discharge from stormwater drains.

2. Refer to NZBC Acceptable Solution E1/AS1 Figure 8 and Figure 9 for examples of surface water sumps (inlet pits) which incorporate submerged outlets and provide sufficient capacity for the settlement of silt and debris."

Appendix A. Proposed changes to the acceptable solutions and verification methods for clause E1 Surface Water

Current E1 Surface Water acceptable solutions and verification methods

(Text to be amended shown in red)



Acceptable Solution E1/AS2

SURFACE WATER

Clause 7.7.1 (a) Delete and replace with:

"(a) a 45° junction, a sweep junction or an oblique junction at an upstream angle not greater than 60°, as shown in Figure 7.7.1(A);"

Clause 7.10 On-Site Stormwater Detention (OSD) Systems Insert:

"In New Zealand, this Clause is informative only."

Section 8 Pumped Systems Insert:

"In New Zealand, this Section is informative only."

Section 10 Siphonic Drainage Systems Insert: "In New Zealand, this Section is informative only."

Appendix D – D.2.2 New Zealand Delete and replace with:

"The procedure for the determination of rainfall intensities, in mm/hr, for the site considered is as follows:

(a) Use the applicable rainfall intensity figures provided by the local territorial authority, or

(b) Use the applicable rainfall intensity figures provided in NZBC Acceptable Solution E1/AS1 Appendix A, or

(c) Use the applicable rainfall intensity figures provided by the National Institute for Water and Atmospheric Research (NIWA) High Intensity Rainfall Design System (HIRDS).

NOTES:

1 Where there are differences between the design rainfall intensities obtained using sources (a), (b) and (c) for a particular location, the most conservative rainfall intensity should be used for design calculations.

2 Territorial Authorities may refer to any available Regional Council rainfall data to establish design rainfall intensities for their city or district."

Appendix F Delete.

Appendix I Figure I1 NOTE Delete and replace with:

"NOTE: The minimum width of a box gutter is 300 mm."

Appendix K Insert:

"This Appendix applies to Australia only.

NOTE: The design solution examples for surface water drainage systems shown in Appendix K do not address the modifications made to AS/NZS 3500.3 by NZBC Acceptable Solution E1/AS2 and do not reflect requirements in New Zealand."

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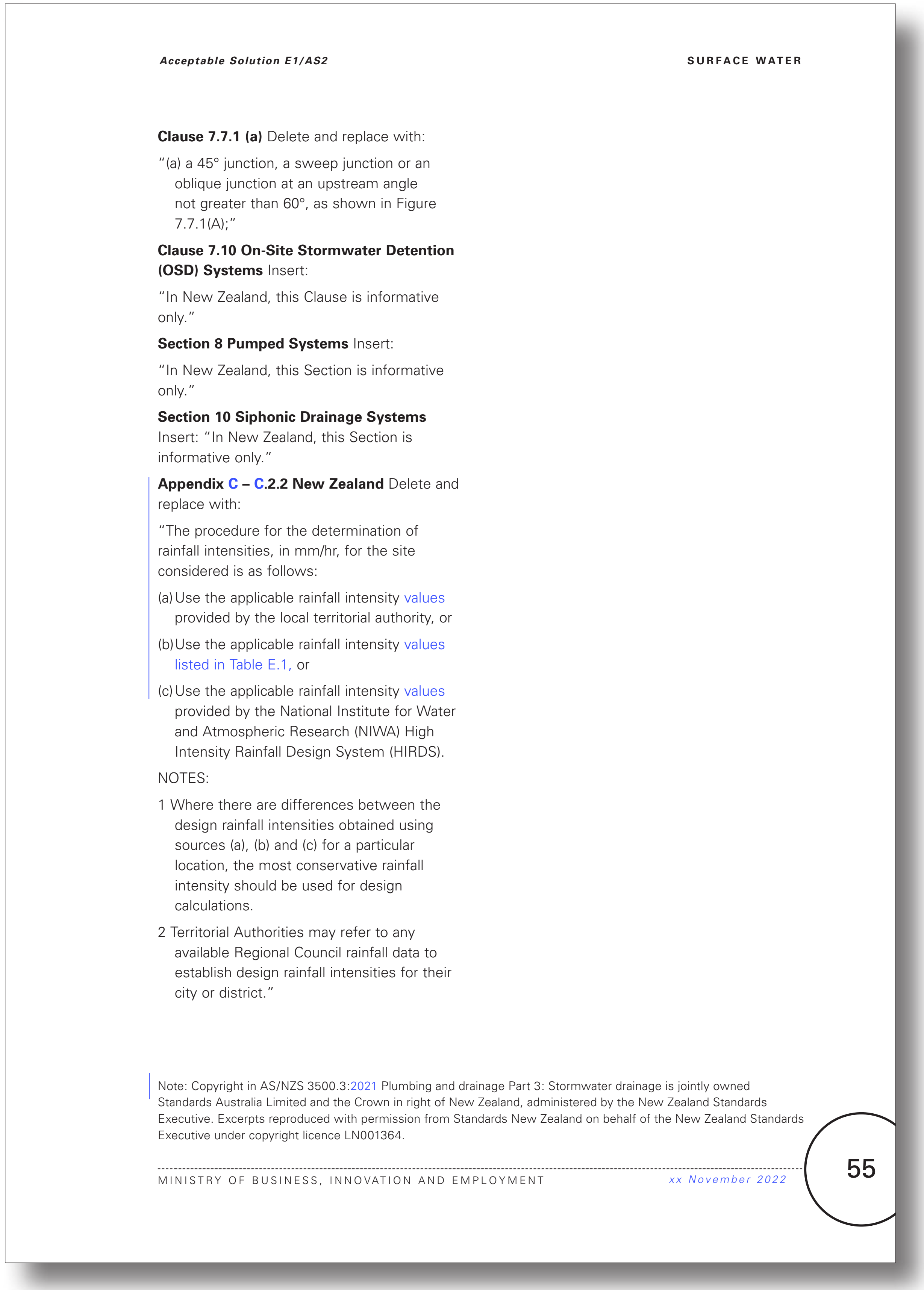
Proposed amendments to E1 Surface Water acceptable solutions and verification methods (Proposed text in blue)



Acceptable Solution E1/AS2

SURFACE WATER

Clause 7.7.1 (a) Delete and replace with:

"(a) a 45° junction, a sweep junction or an oblique junction at an upstream angle not greater than 60°, as shown in Figure 7.7.1(A);"

Clause 7.10 On-Site Stormwater Detention (OSD) Systems Insert:

"In New Zealand, this Clause is informative only."

Section 8 Pumped Systems Insert:

"In New Zealand, this Section is informative only."

Section 10 Siphonic Drainage Systems Insert: "In New Zealand, this Section is informative only."

Appendix C – C.2.2 New Zealand Delete and replace with:

"The procedure for the determination of rainfall intensities, in mm/hr, for the site considered is as follows:

(a) Use the applicable rainfall intensity values provided by the local territorial authority, or

(b) Use the applicable rainfall intensity values listed in Table E.1, or

(c) Use the applicable rainfall intensity values provided by the National Institute for Water and Atmospheric Research (NIWA) High Intensity Rainfall Design System (HIRDS).

NOTES:

1 Where there are differences between the design rainfall intensities obtained using sources (a), (b) and (c) for a particular location, the most conservative rainfall intensity should be used for design calculations.

2 Territorial Authorities may refer to any available Regional Council rainfall data to establish design rainfall intensities for their city or district."

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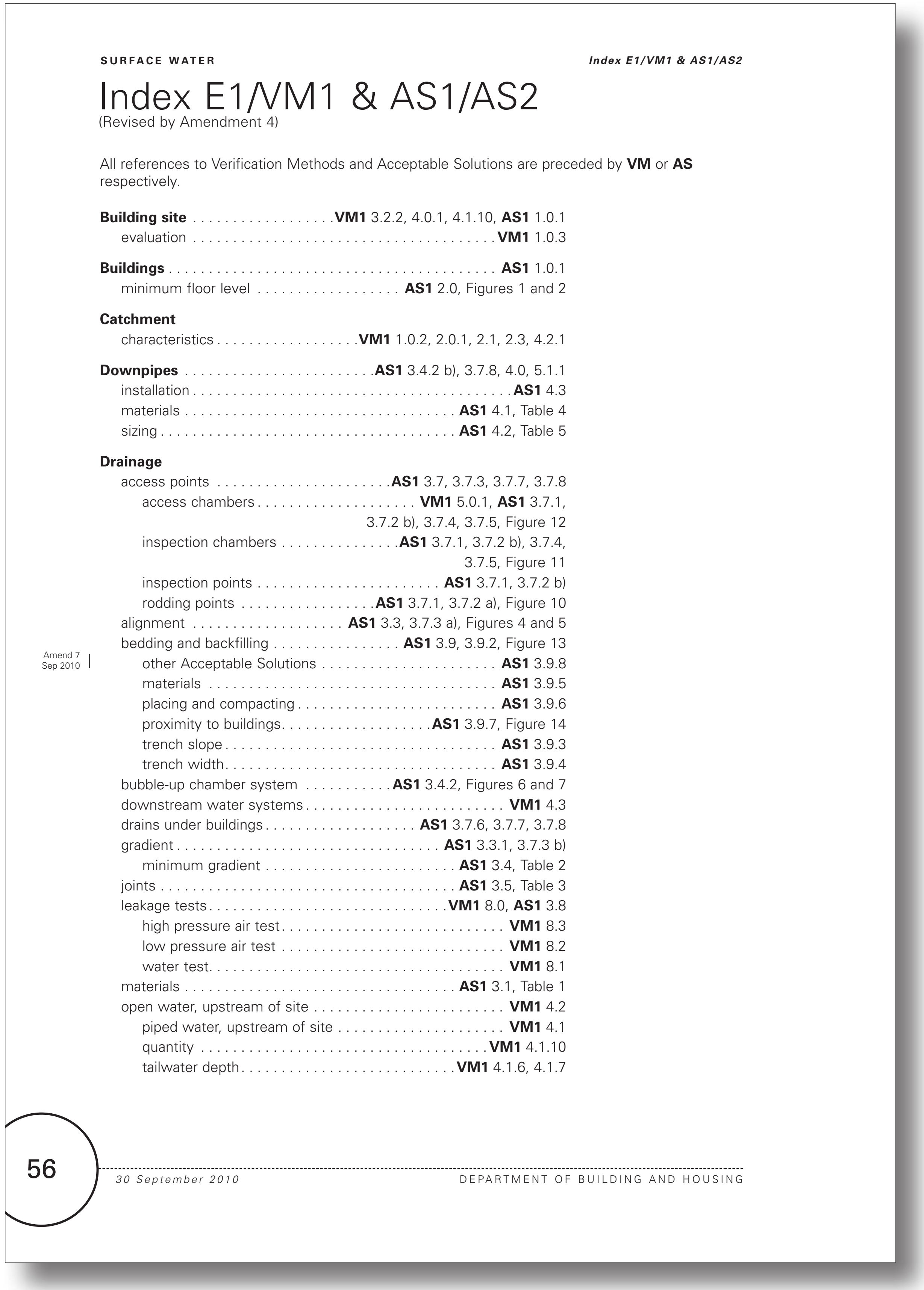
Current E1 Surface Water - No changes proposed to this page

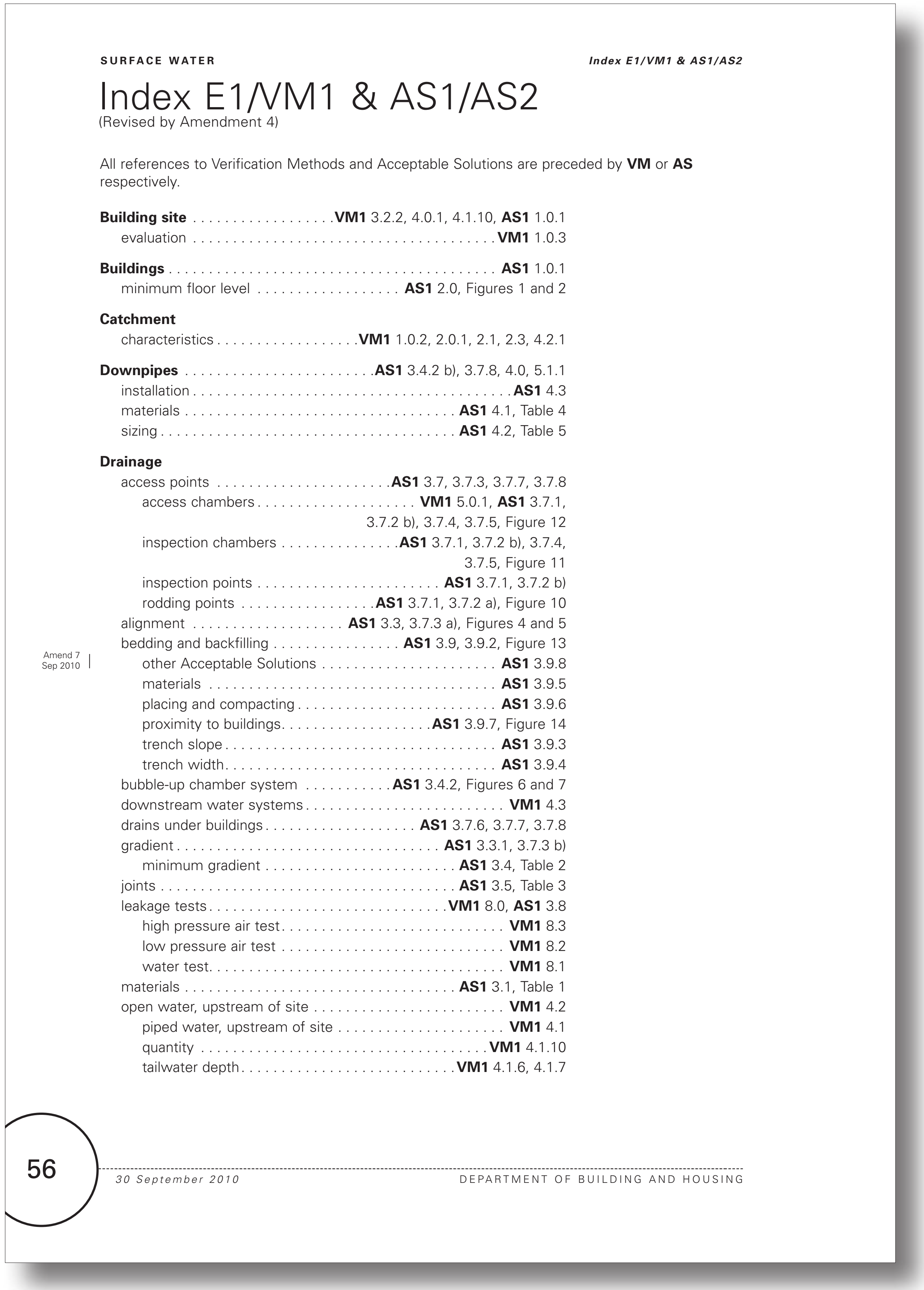


Index E1/VM1 & AS1/AS2

(Revised by Amendment 4)

All references to Verification Methods and Acceptable Solutions are preceded by **VM** or **AS** respectively.

Proposed E1 Surface Water - No changes proposed to this page



SURFACE WATER *Index E1/VM1 & AS1/AS2*

Index E1/VM1 & AS1/AS2

(Revised by Amendment 4)

All references to Verification Methods and Acceptable Solutions are preceded by **VM** or **AS** respectively.

Building site . . . **VM1** 3.2.2, 4.0.1, 4.1.10, **AS1** 1.0.1
- evaluation . . . **VM1** 1.0.3

Buildings . . . **AS1** 1.0.1
- minimum floor level . . . **AS1** 2.0, Figures 1 and 2

Catchment
- characteristics . . . **VM1** 1.0.2, 2.0.1, 2.1, 2.3, 4.2.1

Downpipes . . . **AS1** 3.4.2 b), 3.7.8, 4.0, 5.1.1
- installation . . . **AS1** 4.3
- materials . . . **AS1** 4.1, Table 4
- sizing . . . **AS1** 4.2, Table 5

Drainage
- access points . . . **AS1** 3.7, 3.7.3, 3.7.7, 3.7.8
  - access chambers . . . **VM1** 5.0.1, **AS1** 3.7.1, 3.7.2 b), 3.7.4, 3.7.5, Figure 12
  - inspection chambers . . . **AS1** 3.7.1, 3.7.2 b), 3.7.4, 3.7.5, Figure 11
  - inspection points . . . **AS1** 3.7.1, 3.7.2 b)
  - rodding points . . . **AS1** 3.7.1, 3.7.2 a), Figure 10
- alignment . . . **AS1** 3.3, 3.7.3 a), Figures 4 and 5
- bedding and backfilling . . . **AS1** 3.9, 3.9.2, Figure 13
  - Amend 7 Sep 2010 other Acceptable Solutions . . . **AS1** 3.9.8
  - materials . . . **AS1** 3.9.5
  - placing and compacting . . . **AS1** 3.9.6
  - proximity to buildings . . . **AS1** 3.9.7, Figure 14
  - trench slope . . . **AS1** 3.9.3
  - trench width . . . **AS1** 3.9.4
- bubble-up chamber system . . . **AS1** 3.4.2, Figures 6 and 7
- downstream water systems . . . **VM1** 4.3
- drains under buildings . . . **AS1** 3.7.6, 3.7.7, 3.7.8
- gradient . . . **AS1** 3.3.1, 3.7.3 b)
  - minimum gradient . . . **AS1** 3.4, Table 2
- joints . . . **AS1** 3.5, Table 3
- leakage tests . . . **VM1** 8.0, **AS1** 3.8
  - high pressure air test . . . **VM1** 8.3
  - low pressure air test . . . **VM1** 8.2
  - water test . . . **VM1** 8.1
- materials . . . **AS1** 3.1, Table 1
- open water, upstream of site . . . **VM1** 4.2
  - piped water, upstream of site . . . **VM1** 4.1
  - quantity . . . **VM1** 4.1.10
  - tailwater depth . . . **VM1** 4.1.6, 4.1.7

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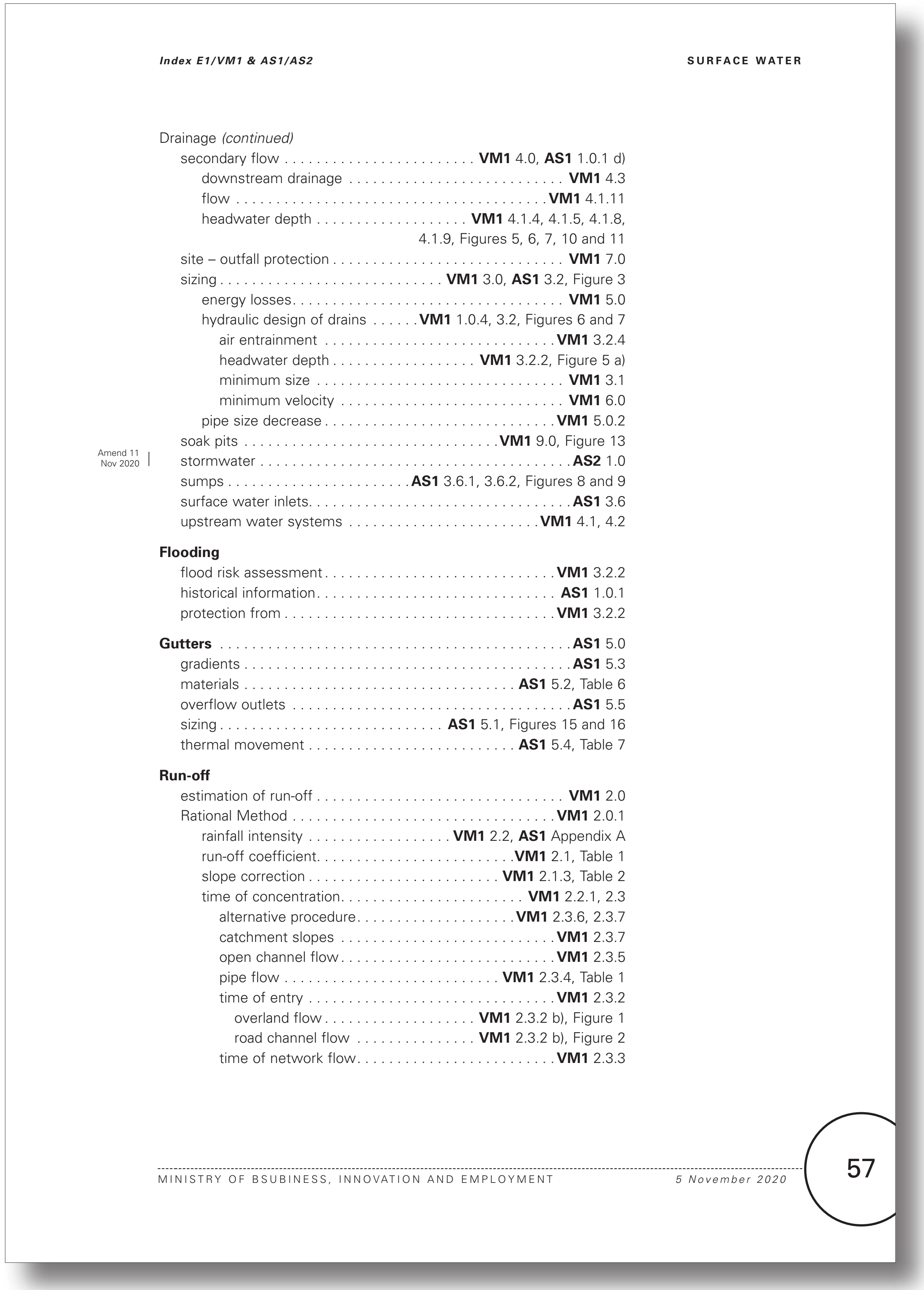
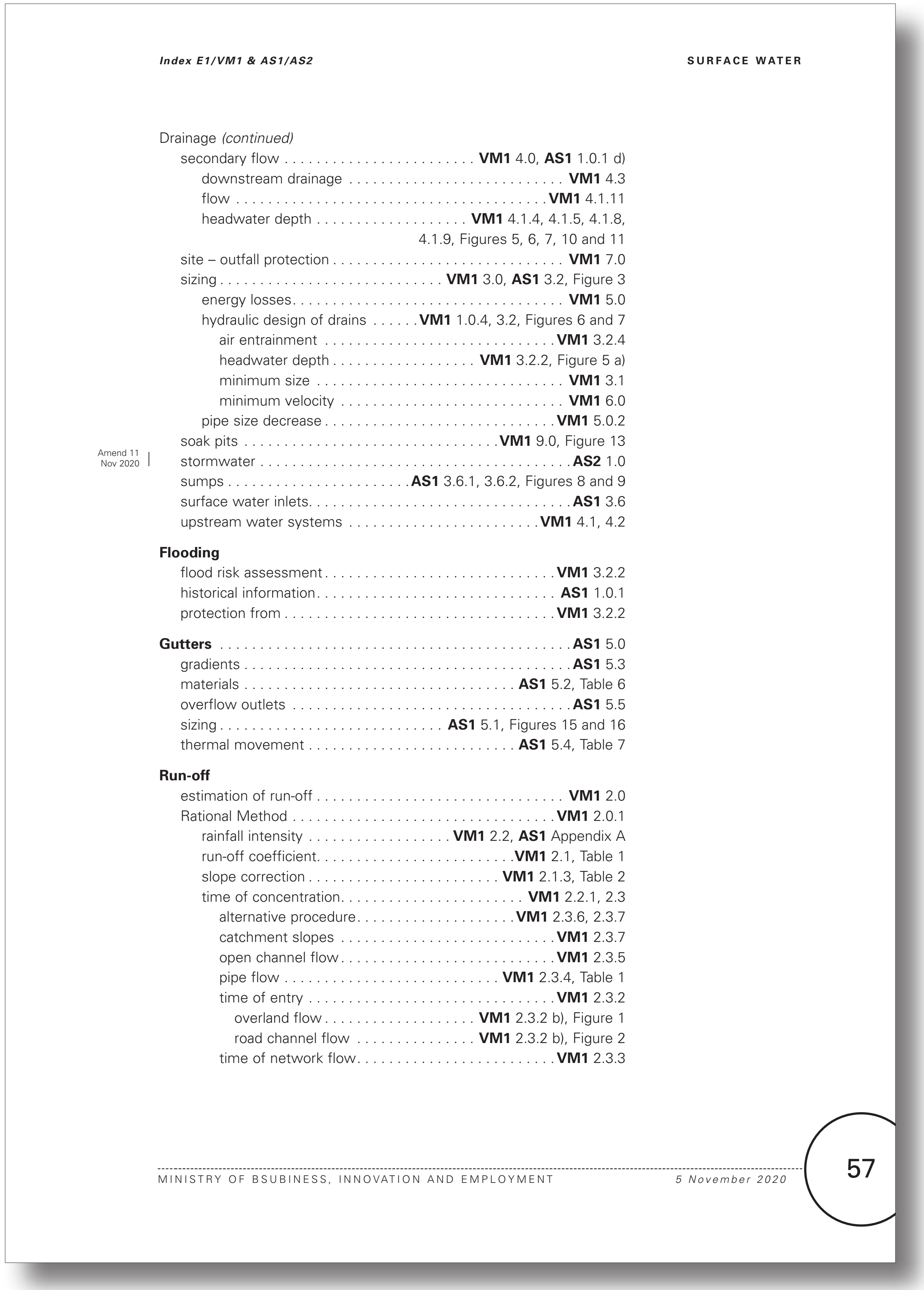
Current E1 Surface Water - No changes proposed to this page



Proposed E1 Surface Water - No changes proposed to this page



Index E1/VM1 & AS1/AS2 SURFACE WATER

Drainage *(continued)*
- secondary flow . . . **VM1** 4.0, **AS1** 1.0.1 d)
  - downstream drainage . . . **VM1** 4.3
  - flow . . . **VM1** 4.1.11
  - headwater depth . . . **VM1** 4.1.4, 4.1.5, 4.1.8, 4.1.9, Figures 5, 6, 7, 10 and 11
- site – outfall protection . . . **VM1** 7.0
- sizing . . . **VM1** 3.0, **AS1** 3.2, Figure 3
  - energy losses . . . **VM1** 5.0
  - hydraulic design of drains . . . **VM1** 1.0.4, 3.2, Figures 6 and 7
    - air entrainment . . . **VM1** 3.2.4
    - headwater depth . . . **VM1** 3.2.2, Figure 5 a)
    - minimum size . . . **VM1** 3.1
    - minimum velocity . . . **VM1** 6.0
  - pipe size decrease . . . **VM1** 5.0.2
- soak pits . . . **VM1** 9.0, Figure 13
- stormwater . . . **AS2** 1.0 Amend 11 Nov 2020
- sumps . . . **AS1** 3.6.1, 3.6.2, Figures 8 and 9
- surface water inlets . . . **AS1** 3.6
- upstream water systems . . . **VM1** 4.1, 4.2

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- flood risk assessment . . . **VM1** 3.2.2
- historical information . . . **AS1** 1.0.1
- protection from . . . **VM1** 3.2.2

Gutters . . . **AS1** 5.0
- gradients . . . **AS1** 5.3
- materials . . . **AS1** 5.2, Table 6
- overflow outlets . . . **AS1** 5.5
- sizing . . . **AS1** 5.1, Figures 15 and 16
- thermal movement . . . **AS1** 5.4, Table 7

Run-off
- estimation of run-off . . . **VM1** 2.0
- Rational Method . . . **VM1** 2.0.1
  - rainfall intensity . . . **VM1** 2.2, **AS1** Appendix A
  - run-off coefficient . . . **VM1** 2.1, Table 1
  - slope correction . . . **VM1** 2.1.3, Table 2
  - time of concentration . . . **VM1** 2.2.1, 2.3
    - alternative procedure . . . **VM1** 2.3.6, 2.3.7
    - catchment slopes . . . **VM1** 2.3.7
    - open channel flow . . . **VM1** 2.3.5
    - pipe flow . . . **VM1** 2.3.4, Table 1
    - time of entry . . . **VM1** 2.3.2
      - overland flow . . . **VM1** 2.3.2 b), Figure 1
      - road channel flow . . . **VM1** 2.3.2 b), Figure 2
    - time of network flow . . . **VM1** 2.3.3

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Appendix B. Proposed changes to the acceptable solutions and verification methods for clause G12 Water Supplies

As part of Proposals 1 through 7, here are proposed changes to the acceptable solutions and verification methods for clause G12 Water Supplies. The list below identifies the portions of the documents that are proposed to be amended as part of each proposal. The proposed changes are presented as part of the full document with the new or amended text shown in blue. This also includes the proposed text for the new Acceptable Solution G12/AS3.

Proposal 1. Lead in plumbing products

- Amendments to Acceptable Solution G12/AS1
    - Issue the new Paragraph 2.1.3 and comment to limit the maximum allowable lead content within plumbing products that contain copper alloy and are intended for use in contact with potable water for human consumption and cite the following testing standard for demonstrating compliance NSF/ANSI/CAN 372: 2020 Drinking Water System Components - Lead Content
    - Issue the new Paragraph 2.2.3 to require components to be dezincification resistant and cite the following testing standard AS 2345: 2006 (R2016) Dezincification resistance of copper alloys

Proposal 2. Water temperatures

- Amendments to Acceptable Solution G12/AS1 to limit maximum hot water delivery temperatures
    - Amend the maximum water temperatures in Paragraph 6.14.1 to reduce the risk of scalding
    - Amend Paragraph 6.14.2, Figure 16 and provide a new Table 7 to list acceptable hot water delivery temperature control devices and manufacturing standards
    - Amend Paragraph 6.14.3 to replace the term ‘mixing’ with ‘delivery temperature control’
    - Redesignate Paragraph 6.14.4 as an informative comment to Paragraph 6.14.3 and include additional comments clarifying that alternative methods of controlling Legionella are outside the scope of G12/AS1
- Cite the following water temperature control device standards in Acceptable Solution G12/AS1
    - BS EN 1111: 2017 Sanitary tap ware – Thermostatic mixing valves (PN 10) General technical specifications
    - BS EN 1287: 2017 Sanitary tapware. Low pressure thermostatic mixing valves. General technical specification
    - AS 4032: Water supply
    - Part 1: 2005 Valves for the control of heated water supply temperatures Thermostatic mixing valves - Materials design and performance requirements
    - Part 2: 2005 (R2015) Tempering valves and end of line temperature-actuated devices
    - Part 3: 2004 Requirements for field-testing, maintenance or replacement of thermostatic mixing valves, tempering valves and end-of-line temperature control devices
    - Part 4: 2014 Thermostatically controlled taps for the control of heated water supply temperatures

Proposal 3. Protection of potable water

- Amendments to Acceptable Solution G12/AS1 to protect potable water supplies from backflow
    - Amend G12/AS1 Paragraphs 3.3.1 Comment, 3.3.2 Comment, 3.3.3 Comment, 3.4.6, 3.5.2 Comment, 3.6.2, 3.6.3, 3.6.4, 3.7.2, 4.3.1; and Table 2 Notes; and Figure 2

  - Issue new G12/AS1 Paragraphs 3.4.3 c), 3.4.6, 3.6.1 b), c) and comment, 3.6.3 b), c) and comment 4, 3.6.4 v) and comment; and Table 2A
- Cite the following backflow prevention standards in Acceptable Solution G12/AS1
  - AS/NZS 2845.3: 2020 Water supply – Backflow prevention devices – Field testing and maintenance of testable devices
  - New Zealand Legislation Water Services Act 2021
  - Water New Zealand and Master Plumbers, Gasfitters and Drainlayers NZ Inc, NZ Backflow testing standard 2019 - Field testing of backflow prevention devices and verification of air gaps
- Provide new definitions for:
  - Drinking water standards
  - Containment backflow protection
  - Point of supply
  - Potable water
- Other amendments to Acceptable Solution G12/AS1 as part of this proposal
  - G12/AS1 Paragraph 4.3.1 – Amend the text to cite AS/NZS 3500.1 for pipeline identification
  - G12/AS1 Figure 2 – Amend the text in diagram (a) to clarify the clear space required

Proposal 4. AS/NZS 3500 Plumbing and drainage standards

- Amendments to Acceptable Solutions G12/AS1
  - Cite the new AS/NZS 3500.1: 2021 Plumbing and drainage – Water Services
- Amendments to Acceptable Solutions G12/AS2
  - Cite the new AS/NZS 3500.4: 2021 Plumbing and drainage – Heated water services
- Issuing the new Acceptable Solutions G12/AS3
  - Issue the new Acceptable Solution G12/AS3 which cites AS/NZS 3500.1: 2021 Plumbing and drainage – Water Services and AS/NZS 3500.4: 2021 Plumbing and drainage – Heated water services as a means of demonstrating compliance with clause G12

Proposal 5. Plumbing system components

- Amendments to Acceptable Solution G12/AS1

  Introducing expansion vessels as an option for managing thermal expansion within mains pressure storage water heating systems

  - Amend G12/AS1 Paragraphs 6.2.2, 6.3.3 a), 6.6.1 and 6.6.3
  - Issue new G12/AS1 Paragraphs 6.6.5 c), 6.6.7, 6.6.8, Table 7 and Figure 8 (a)
  - Cite BS EN 13831: 2007 Closed expansion vessels with built-in diaphragm for installation in water

  Seismic restraint of water heaters

  - Amend G12/AS1 Figure 14 to provide more options for the positioning of seismic restraint straps

  Accessible Taps

  - Amend G12/AS1 Paragraph 8.0.1 and Figure 18 to clarify the requirements for accessible lever handle taps, remove the provisions for capstan handle taps and allow for sensors taps to be provided for use by people with disabilities

  Wet-back water heaters

  - Amend G12/AS1 Paragraph 6.13.1
  - Cite Part 4 of NZS 4603: 1985 Installation of low-pressure thermal storage electric water heaters with copper cylinders (open-vented systems): Amendment 1 for the design and installation of wet-back water heating systems

  UV resistant pipework insulation material

  - Amend G12/AS1 Paragraphs 6.7.6 and 6.8.3 b)

  - Issue new G12/AS1 Paragraph 6.7.7 to specify that pipework insulation material exposed to direct sunlight to be UV resistant or suitably protected to withstand the degradation that can be caused by exposure to ultraviolet light

  Cleaning and disinfection of water storage tanks

  - Issue new G12/AS1 Paragraph 5.1.2 and 5.2.2 comment to cite AS/NZS 3500.1: 2021 for the cleaning and disinfection of potable water tanks and overflow pipe discharge locations.

  Minimum and maximum water pressures at sanitary fixtures

  - Issue new G12/AS1 Paragraphs 5.3.1, 5.3.2 and 5.3.3 and a comment to specify minimum and maximum water pressures for sanitary fixtures, sanitary appliances and hose taps.

  Water supply pipework installation standards

  - Amend G12/AS1 Paragraph 7.4.1
  - Issue new G12/AS1 Paragraphs 7.5.2 and 7.5.3
  - Cite the following water supply pipework installation standards in Acceptable Solution G12/AS1
    - AS/NZS 2033: 2008 Installation of polyethylene pipe systems Amendment 1, 2
    - AS 4809: 2017 Copper pipe and fittings – Installation and commissioning

  Unintentional heating of cold water

  - Issue the new Paragraph 7.3.1 and a comment to require water supply systems to be installed in a manner that avoids the unintentional heating of cold water

  Relief valve drain discharge locations and tundish drain sizing

  - Issue Paragraph 6.7.2 d) comment, Figure 12 Note and Figure 13 Note to provide examples of acceptable storage water heater relief valve drain discharge locations and additional information regarding the sizing of relief valve tundish drains

  Minimum pipework cover below ground level for non-trafficable areas

  - Amend Paragraph 7.3.2 to reduce the minimum cover of water supply pipes below gardens, lawns, paths paving for pedestrian use or other areas not subjected to vehicular traffic to 300 mm

  Flushing of water supply systems on completion of construction

  Issue Paragraph 7.7.1 to require newly installed and altered water supply systems to be flushed at each discharge point to remove any dirty water or debris on completion of construction.

- Amendments to Verification method G12/VM1 for the water pipe sizing calculation method
  - Remove the citation of AS/NZS 3500.1 and AS/NZS 3500.4
  - Cite the loading unit method of the Chartered Institute of Plumbing and Heating Engineering, Plumbing Engineering Services Design Guide, Hornchurch 2002 for determining maximum simultaneous flow rates for use in sizing hot and cold water services in multiple types of buildings

Proposal 6. Plumbing and drainage system material standards

- Cite the following water supply system material standards in Acceptable Solution G12/AS1
  - BS 6920 Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water
  - Part 1: 2000 Specification
  - Part 2: 2000 Methods of tests
  - AS 1357.1: 2019 Valves primarily for use in heated water systems, Part 1: Protection valves
  - AS 1432: 2004 Copper tubes for plumbing, gasfitting and drainage applications
  - AS 3498: 2020 Safety and public health requirements for plumbing products - Water heaters and hot-water storage tanks
  - AS 3688: 2016 Water supply and gas systems – Metallic fittings and end connectors

  - AS 5200.053 Plumbing and drainage products – Stainless steel pipes and tubes for pressure applications
  - AS/NZS 1477: 2017 PVC pipes and fittings for pressure applications
  - AS/NZS 2492: 2007 Cross-linked polyethylene (PE-X) pipes for pressure applications
  - AS/NZS 2537: Mechanical jointing fittings for use with crosslinked polyethylene (PE-X) for pressure applications
    - Part 1: 2011 Plastics piping systems for hot and cold-water installations – Crosslinked polyethylene (PE-X) - General
    - Part 2: 2011 Plastics piping systems for hot and cold-water installations – Crosslinked polyethylene (PE-X) – Fittings Amendment 1
    - Part 3: 2011 Plastics piping systems for hot and cold-water installations – Crosslinked polyethylene (PE-X) - Fitness for purpose of the system
    - Part 4: 2011 Plastics piping systems for hot and cold-water installations – Crosslinked polyethylene (PE-X) - Guidance for the assessment of conformity.
  - AS/NZS 2642.1: 2007 Polybutylene pipe systems – Polybutylene (PB) pipe extrusion compounds Amendment 1
  - AS/NZS 3879: 2011 Solvent cements and priming fluids for PVC (PVC-U and PVC-M) and ABS and ASA pipes and fittings
  - AS/NZS 4020: 2018 Testing of products for use in contact with drinking water
  - AS/NZS 4129: 2020 Fittings for polyethylene (PE) pipes for pressure applications
  - AS/NZS 4130: 2018 Polyethylene (PE) pipes for pressure applications Amendment 1
  - New Zealand Regulations Gas (Safety and Measurement) Regulations 2010
- Remove the following references from G12/AS1
  - NZS/BS 1387: 1985 Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or screwing to BS 21 pipe threads Amendment 1
  - NZS 5807.2: 1980 Code of practice for industrial identification by colour, wording or other coding – Identification of contents of piping, conduit and ducts Amendments 1, 2
  - NZS 7601: 1978 Specification for polyethylene pipe (Type 3) for cold water services
  - NZS 7602: 1977 Specification for polyethylene pipe (Type 5) for cold water services Amendment 1
  - NZS 7610: 1991 Specification for blue polyethylene pipes up to nominal size 63 for below ground use for potable water Amends: 1, 2, 3
- Acceptable Solution G12/AS1
  - Table 1 – Amend the list of materials for hot and cold-water pipes and fittings to include additional types of materials and cite the relevant standards for their manufacturing and installation, and remove galvanised steel as an acceptable material
  - Table 5 – Amend the cited regulations for gas storage and instantaneous water heaters
  - Paragraph 2.2.4 – Provide a new comment indicating that WaterMarked products may be verified as satisfying the relevant performance requirements of Building Code Clause G12 Water Supplies.

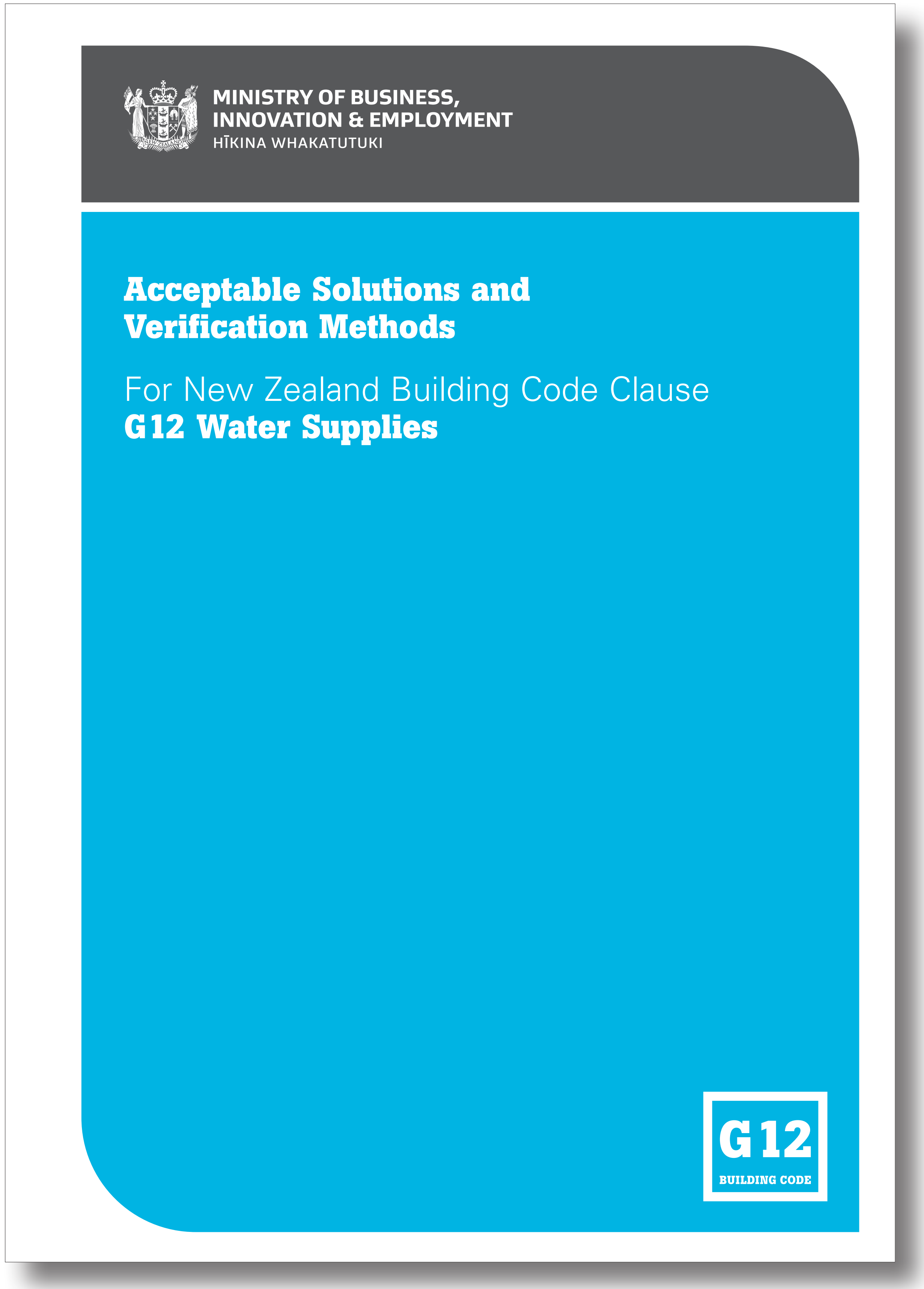
Proposal 7. Resolving conflicts and editorial changes

- G12/AS1 Storage water heater vent pipe standing water level – Add a new dimension to G12/AS1 Figure 7 to align the standing water level dimension with the requirements of G12/AS1 Paragraph 6.8.2 e)
- G12/AS1 Free outlet (push through) storage water heating system relief valve – Add a relief valve on the free outlet (push through) water heater shown in Figure 11 to align with the requirements of G12/AS1 Paragraph 6.4.2
- G12/AS1 Legionella control within circulatory heated water systems - Move G12/AS1 Paragraph 6.14.4 to an informative comment to Paragraph 6.14.3 and provide clarification that the design and installation of hot or warm water circulating systems and alternative methods of controlling Legionella within these systems is outside the scope of G12/AS1
- G12/AS1 Water pipe size table references – Amend Paragraph 5.3.1 comment, Table 3 and Table 4 - to clarify pipe sizing table references

Appendix B. Proposed changes to the acceptable solutions and verification methods for clause G12 Surface Water

- G12/AS1 Paragraph 7.6.2 – Update structure of PVC-U pipework testing method paragraph for consistency
- G12/AS2 Flashing of pipe penetrations through profiled metal roofs – Amend the text in G12/AS2 Paragraph 5.2.5 and 5.2.6 and Figure 6 for flashing dimensions for consistency with equivalent requirements found in Acceptable Solution E2/AS1 Paragraph 8.4.17 a).

Current G12 Water Supplies - No changes proposed to this page



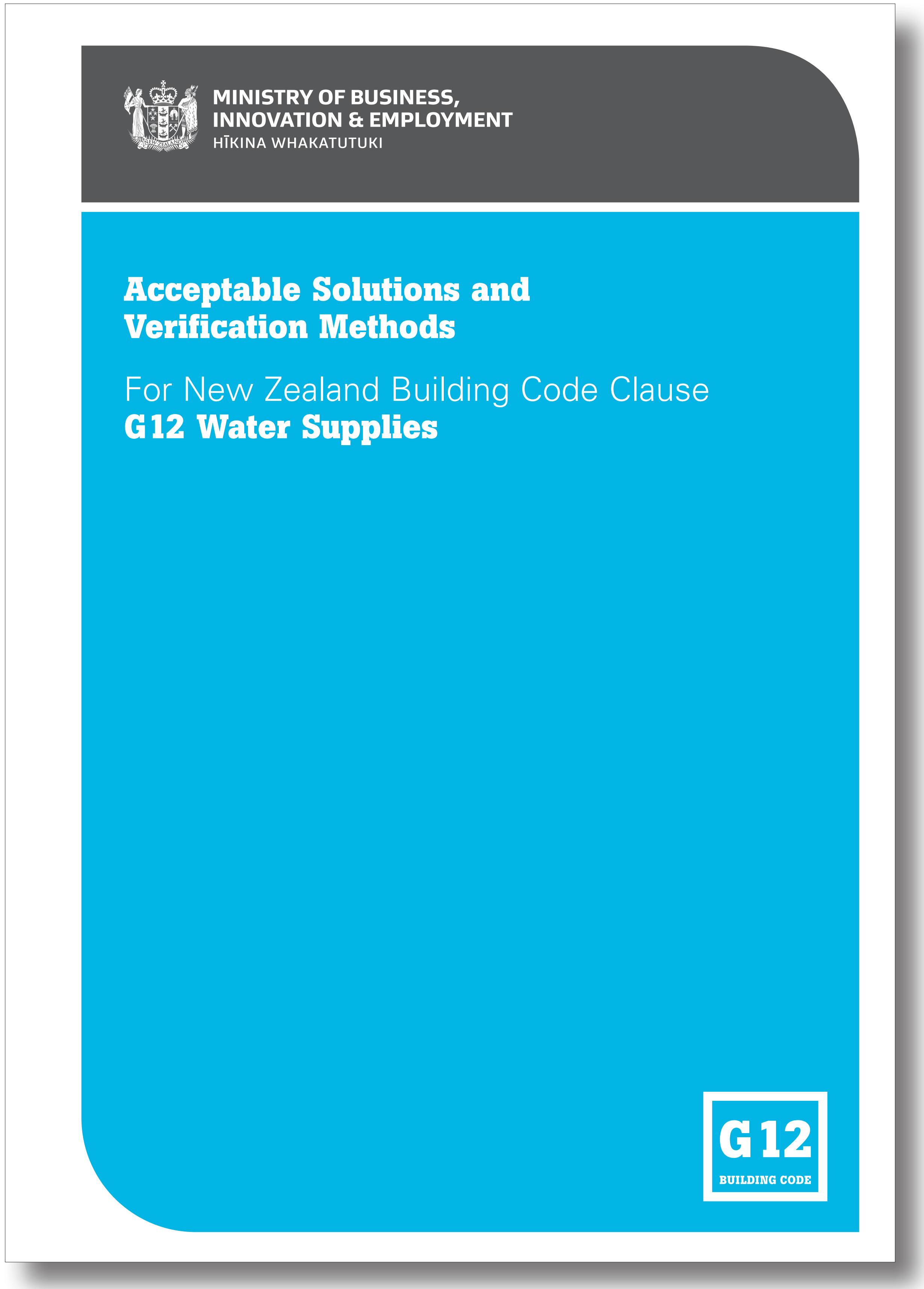
MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Acceptable Solutions and Verification Methods

For New Zealand Building Code Clause
G12 Water Supplies

G12
BUILDING CODE

Proposed G12 Water Supplies - No changes proposed to this page



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Acceptable Solutions and Verification Methods

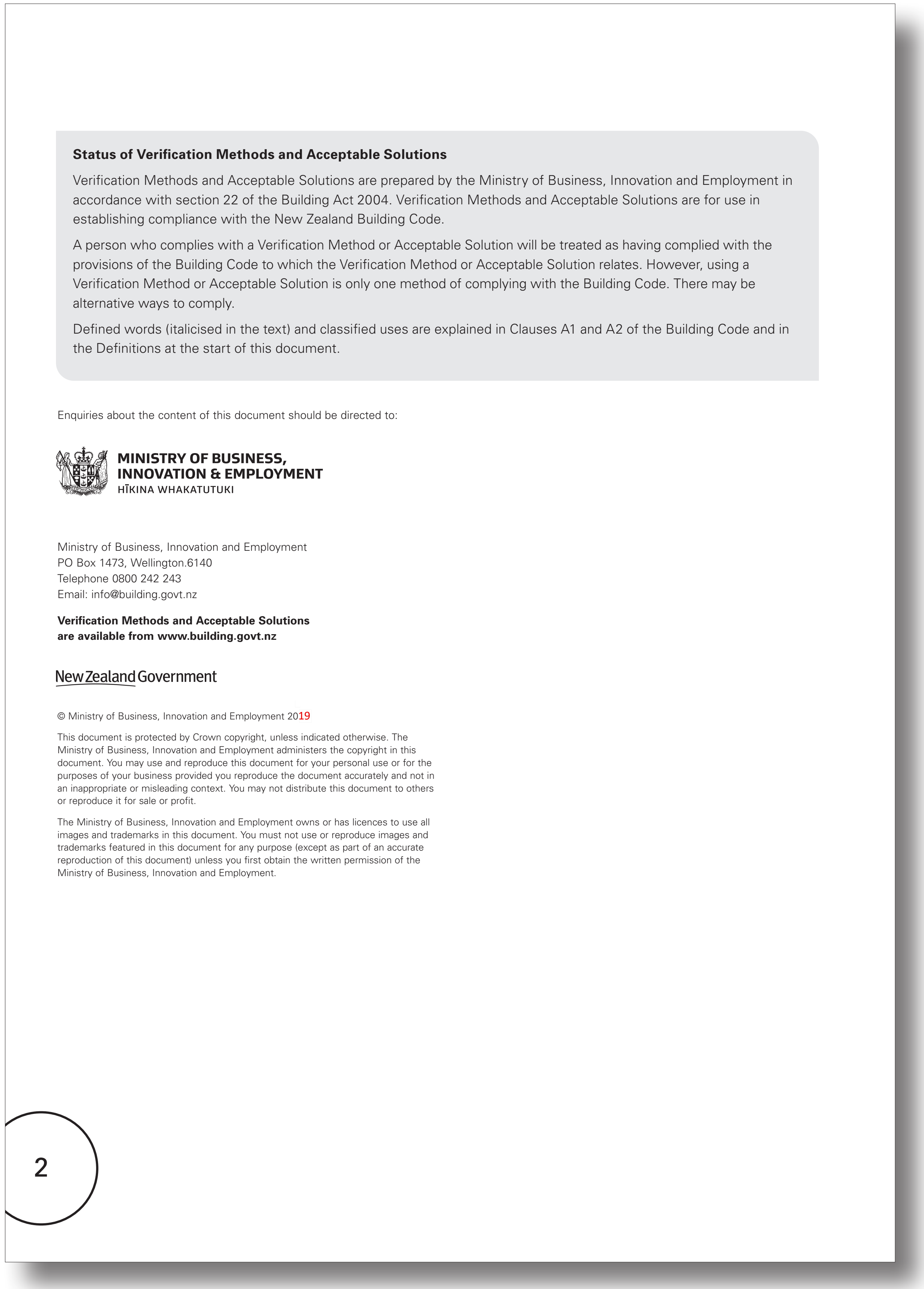
For New Zealand Building Code Clause
G12 Water Supplies

G12
BUILDING CODE

Appendix B. Proposed changes to the acceptable solutions and verification methods for clause G12 Water Supplies

Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



Status of Verification Methods and Acceptable Solutions

Verification Methods and Acceptable Solutions are prepared by the Ministry of Business, Innovation and Employment in accordance with section 22 of the Building Act 2004. Verification Methods and Acceptable Solutions are for use in establishing compliance with the New Zealand Building Code.

A person who complies with a Verification Method or Acceptable Solution will be treated as having complied with the provisions of the Building Code to which the Verification Method or Acceptable Solution relates. However, using a Verification Method or Acceptable Solution is only one method of complying with the Building Code. There may be alternative ways to comply.

Defined words (italicised in the text) and classified uses are explained in Clauses A1 and A2 of the Building Code and in the Definitions at the start of this document.

Enquiries about the content of this document should be directed to:

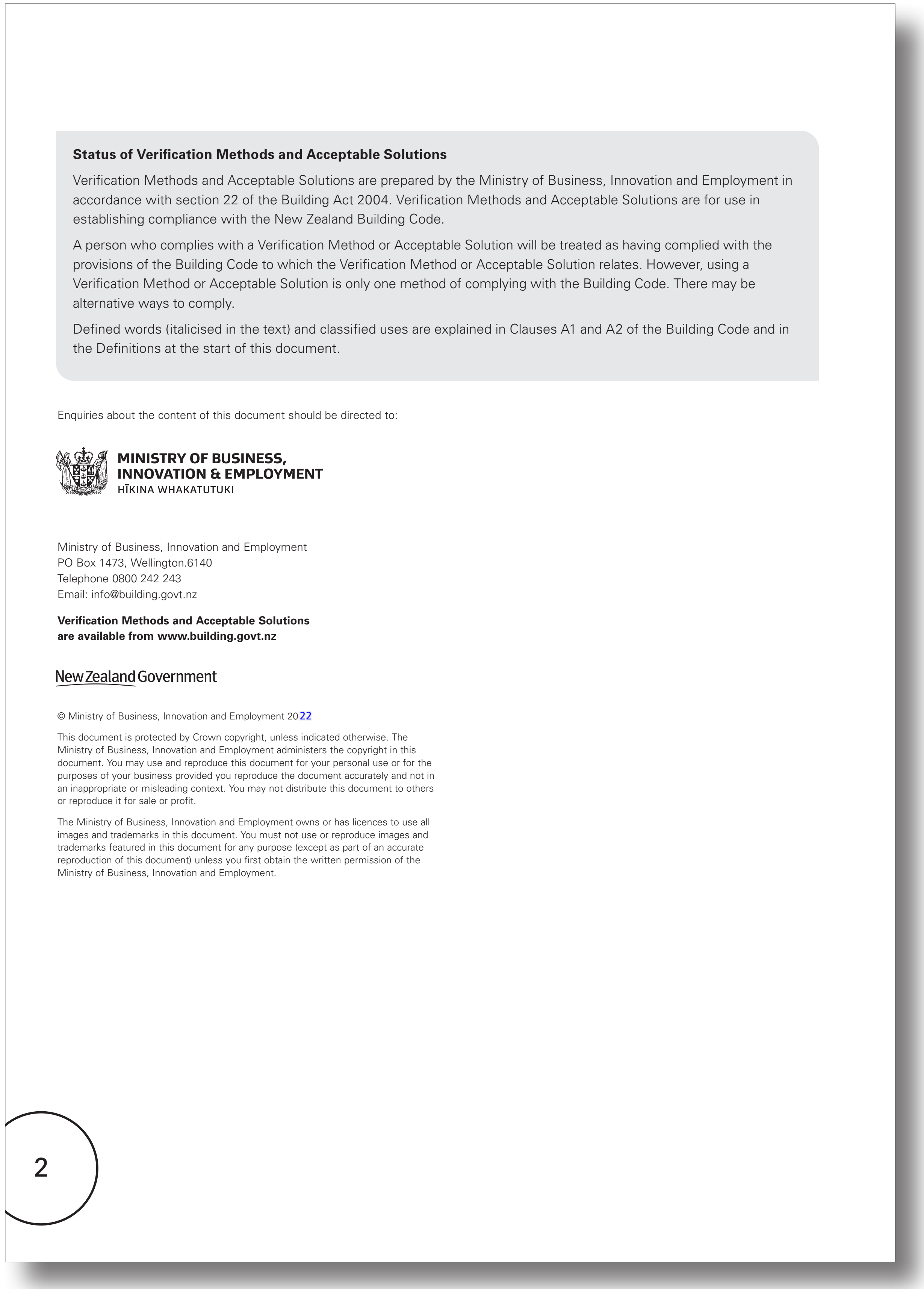
MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Ministry of Business, Innovation and Employment
PO Box 1473, Wellington.6140
Telephone 0800 242 243
Email: info@building.govt.nz

Verification Methods and Acceptable Solutions
are available from www.building.govt.nz

New Zealand Government

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



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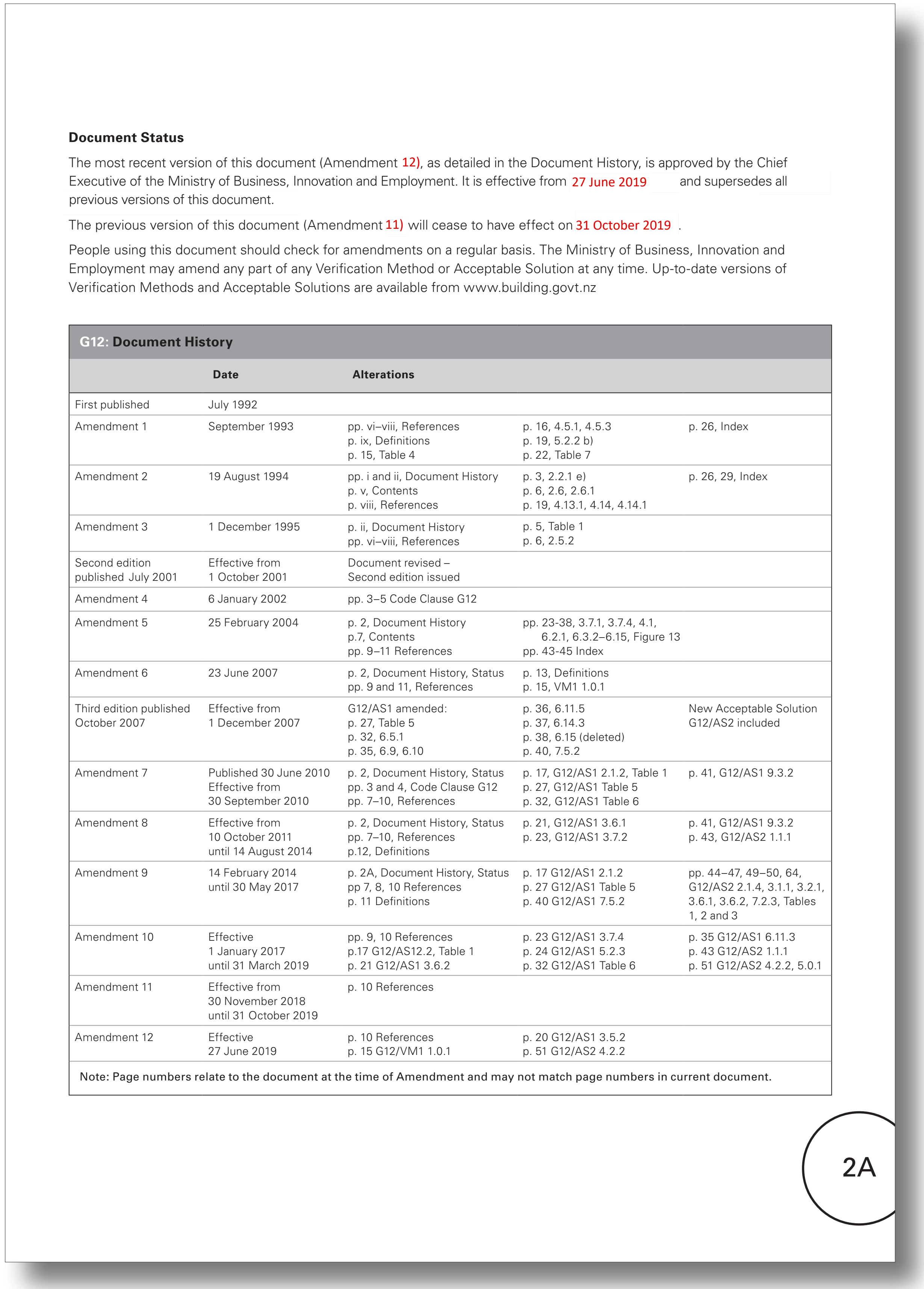
Appendix B. Proposed changes to the acceptable solutions and verification methods for clause G12 Water Supplies

Current G12 Water Supplies acceptable solutions and verification methods (Text to be amended shown in red)



Document Status

The most recent version of this document (Amendment 12), as detailed in the Document History, is approved by the Chief Executive of the Ministry of Business, Innovation and Employment. It is effective from 27 June 2019 and supersedes all previous versions of this document.

The previous version of this document (Amendment 11) will cease to have effect on 31 October 2019 .

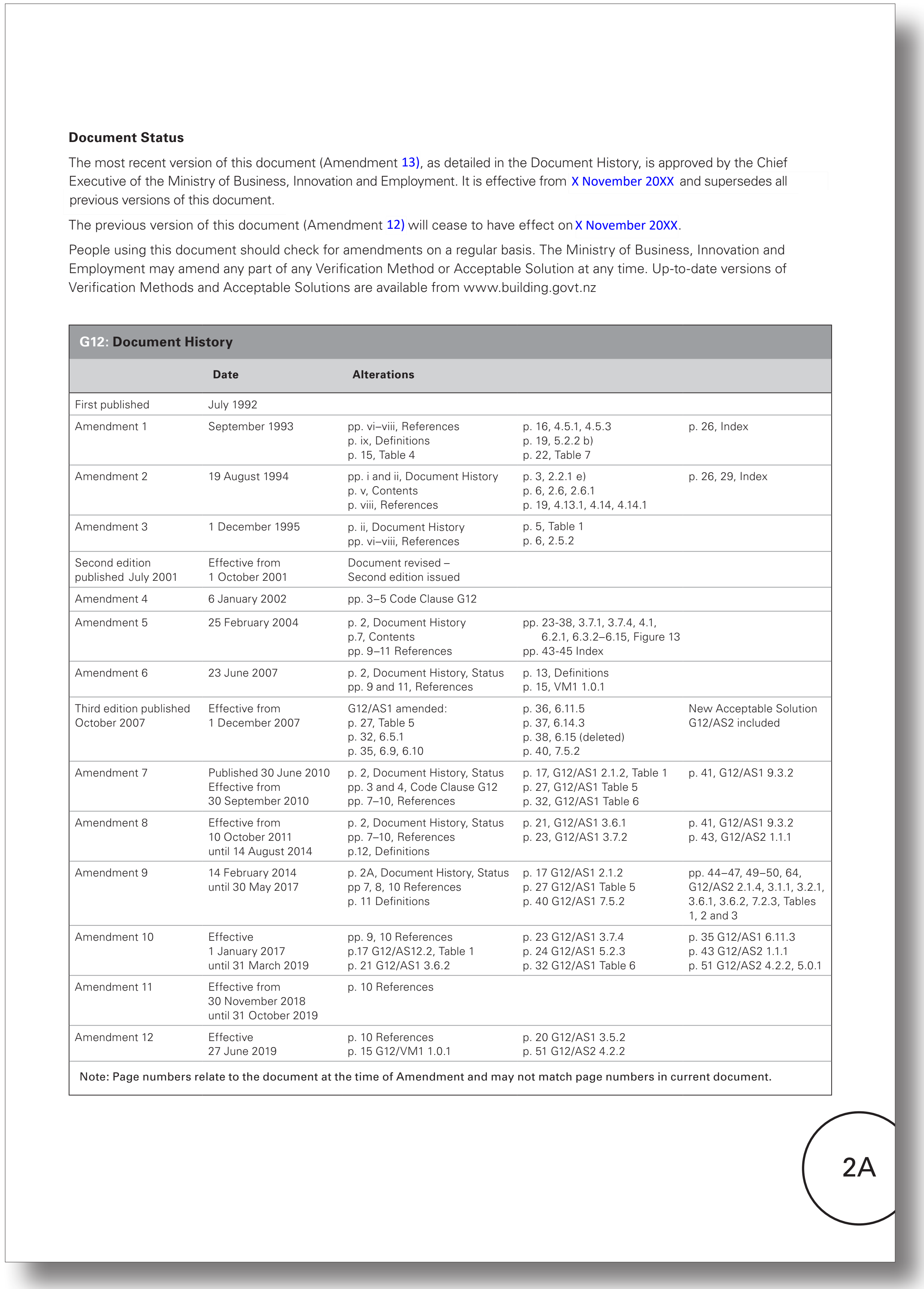
People using this document should check for amendments on a regular basis. The Ministry of Business, Innovation and Employment may amend any part of any Verification Method or Acceptable Solution at any time. Up-to-date versions of Verification Methods and Acceptable Solutions are available from www.building.govt.nz

G12: Document History

	Date	Alterations		
First published	July 1992			
Amendment 1	September 1993	pp. vi–viii, References p. ix, Definitions p. 15, Table 4	p. 16, 4.5.1, 4.5.3 p. 19, 5.2.2 b) p. 22, Table 7	p. 26, Index
Amendment 2	19 August 1994	pp. i and ii, Document History p. v, Contents p. viii, References	p. 3, 2.2.1 e) p. 6, 2.6, 2.6.1 p. 19, 4.13.1, 4.14, 4.14.1	p. 26, 29, Index
Amendment 3	1 December 1995	p. ii, Document History pp. vi–viii, References	p. 5, Table 1 p. 6, 2.5.2	
Second edition published July 2001	Effective from 1 October 2001	Document revised – Second edition issued		
Amendment 4	6 January 2002	pp. 3–5 Code Clause G12		
Amendment 5	25 February 2004	p. 2, Document History p.7, Contents pp. 9–11 References	pp. 23-38, 3.7.1, 3.7.4, 4.1, 6.2.1, 6.3.2–6.15, Figure 13 pp. 43-45 Index	
Amendment 6	23 June 2007	p. 2, Document History, Status pp. 9 and 11, References	p. 13, Definitions p. 15, VM1 1.0.1	
Third edition published October 2007	Effective from 1 December 2007	G12/AS1 amended: p. 27, Table 5 p. 32, 6.5.1 p. 35, 6.9, 6.10	p. 36, 6.11.5 p. 37, 6.14.3 p. 38, 6.15 (deleted) p. 40, 7.5.2	New Acceptable Solution G12/AS2 included
Amendment 7	Published 30 June 2010 Effective from 30 September 2010	p. 2, Document History, Status pp. 3 and 4, Code Clause G12 pp. 7–10, References	p. 17, G12/AS1 2.1.2, Table 1 p. 27, G12/AS1 Table 5 p. 32, G12/AS1 Table 6	p. 41, G12/AS1 9.3.2
Amendment 8	Effective from 10 October 2011 until 14 August 2014	p. 2, Document History, Status pp. 7–10, References p.12, Definitions	p. 21, G12/AS1 3.6.1 p. 23, G12/AS1 3.7.2	p. 41, G12/AS1 9.3.2 p. 43, G12/AS2 1.1.1
Amendment 9	14 February 2014 until 30 May 2017	p. 2A, Document History, Status pp 7, 8, 10 References p. 11 Definitions	p. 17 G12/AS1 2.1.2 p. 27 G12/AS1 Table 5 p. 40 G12/AS1 7.5.2	pp. 44–47, 49–50, 64, G12/AS2 2.1.4, 3.1.1, 3.2.1, 3.6.1, 3.6.2, 7.2.3, Tables 1, 2 and 3
Amendment 10	Effective 1 January 2017 until 31 March 2019	pp. 9, 10 References p.17 G12/AS12.2, Table 1 p. 21 G12/AS1 3.6.2	p. 23 G12/AS1 3.7.4 p. 24 G12/AS1 5.2.3 p. 32 G12/AS1 Table 6	p. 35 G12/AS1 6.11.3 p. 43 G12/AS2 1.1.1 p. 51 G12/AS2 4.2.2, 5.0.1
Amendment 11	Effective from 30 November 2018 until 31 October 2019	p. 10 References		
Amendment 12	Effective 27 June 2019	p. 10 References p. 15 G12/VM1 1.0.1	p. 20 G12/AS1 3.5.2 p. 51 G12/AS2 4.2.2	
Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.				

2A

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



Document Status

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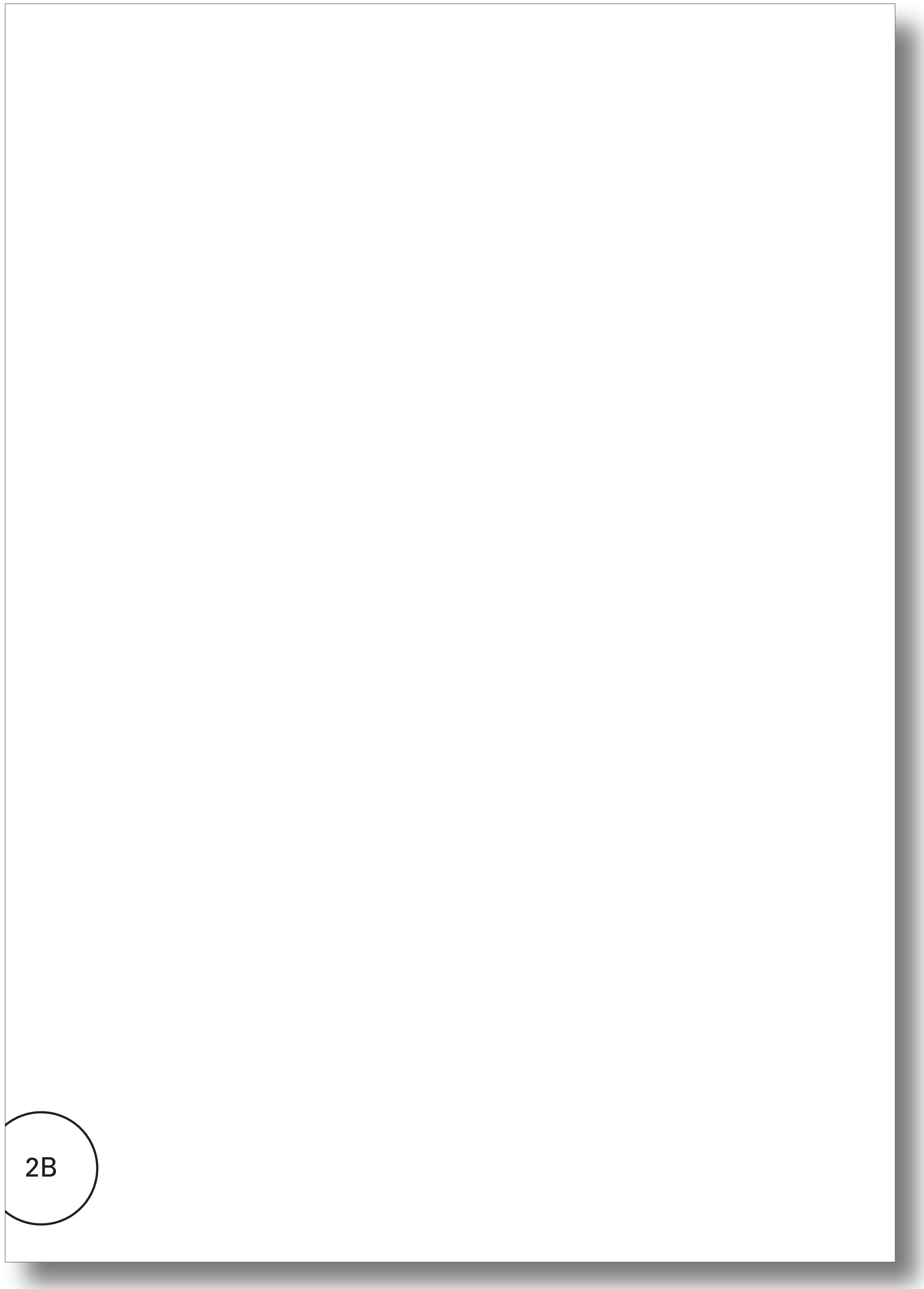
Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.				

2A

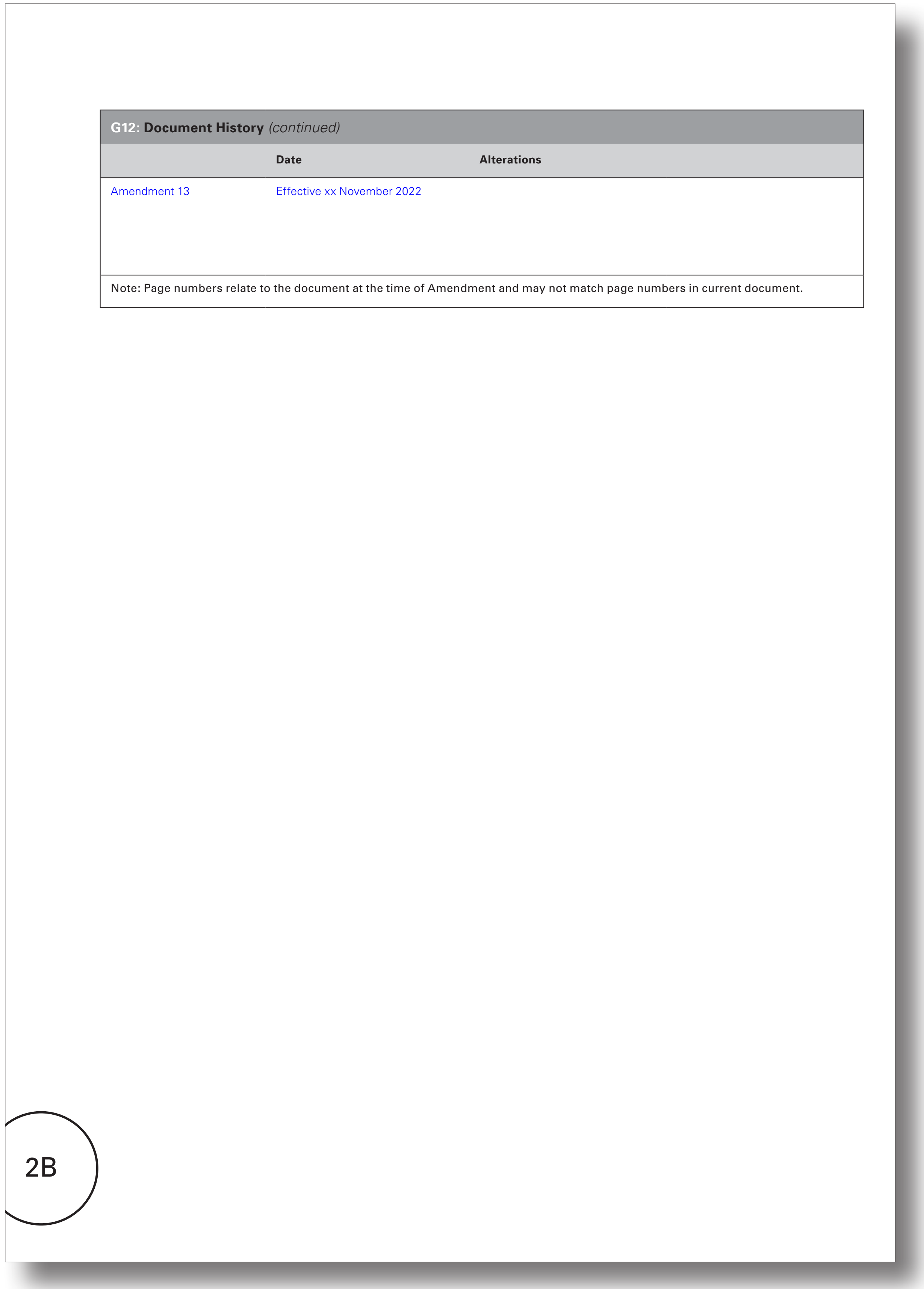
Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



2B

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



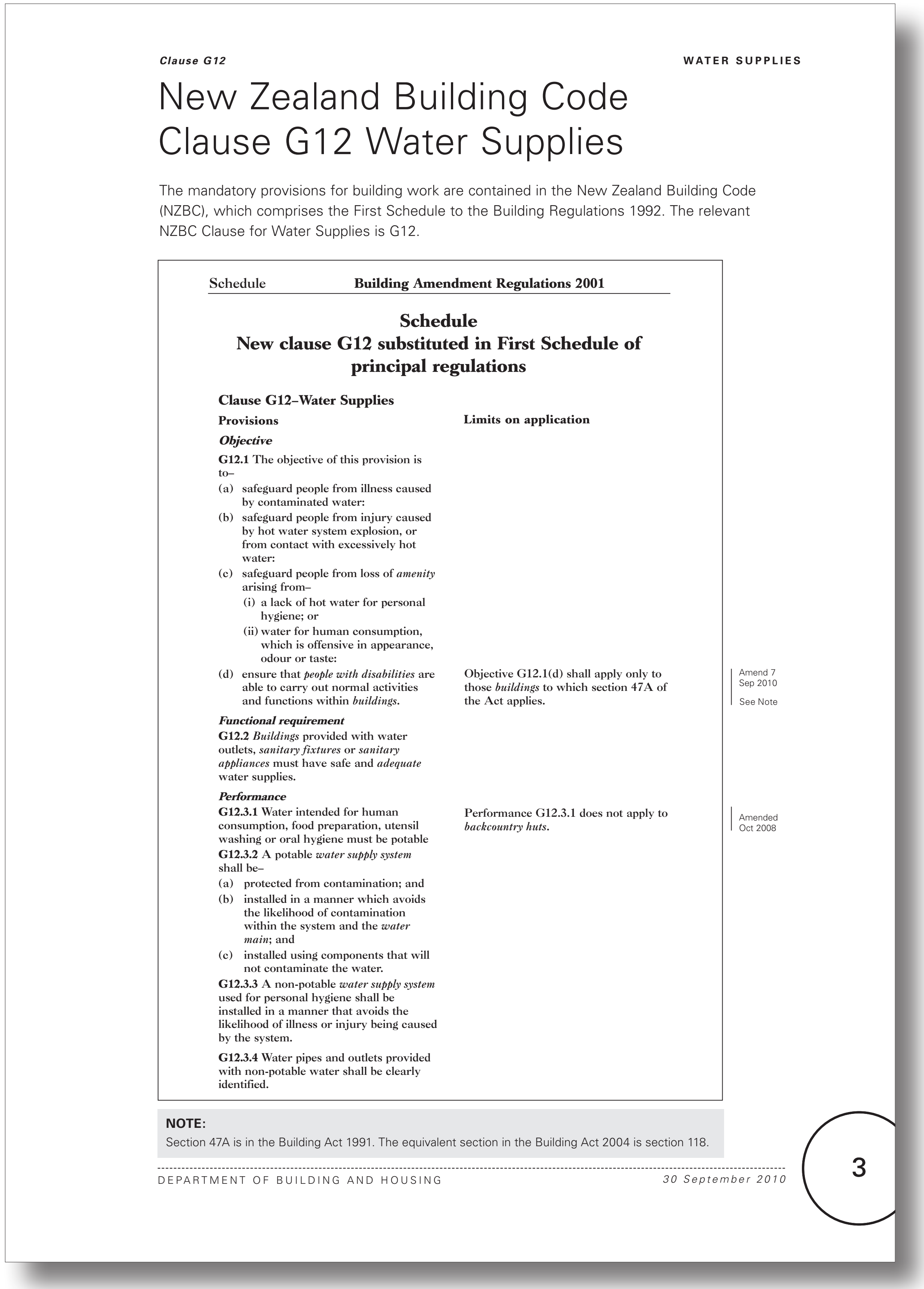
G12: Document History *(continued)*

	Date	Alterations
Amendment 13	Effective xx November 2022	

Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.

2B

Current G12 Water Supplies - No changes proposed to this page



Clause G12 WATER SUPPLIES

New Zealand Building Code Clause G12 Water Supplies

The mandatory provisions for building work are contained in the New Zealand Building Code (NZBC), which comprises the First Schedule to the Building Regulations 1992. The relevant NZBC Clause for Water Supplies is G12.

Schedule **Building Amendment Regulations 2001**

Schedule
New clause G12 substituted in First Schedule of principal regulations

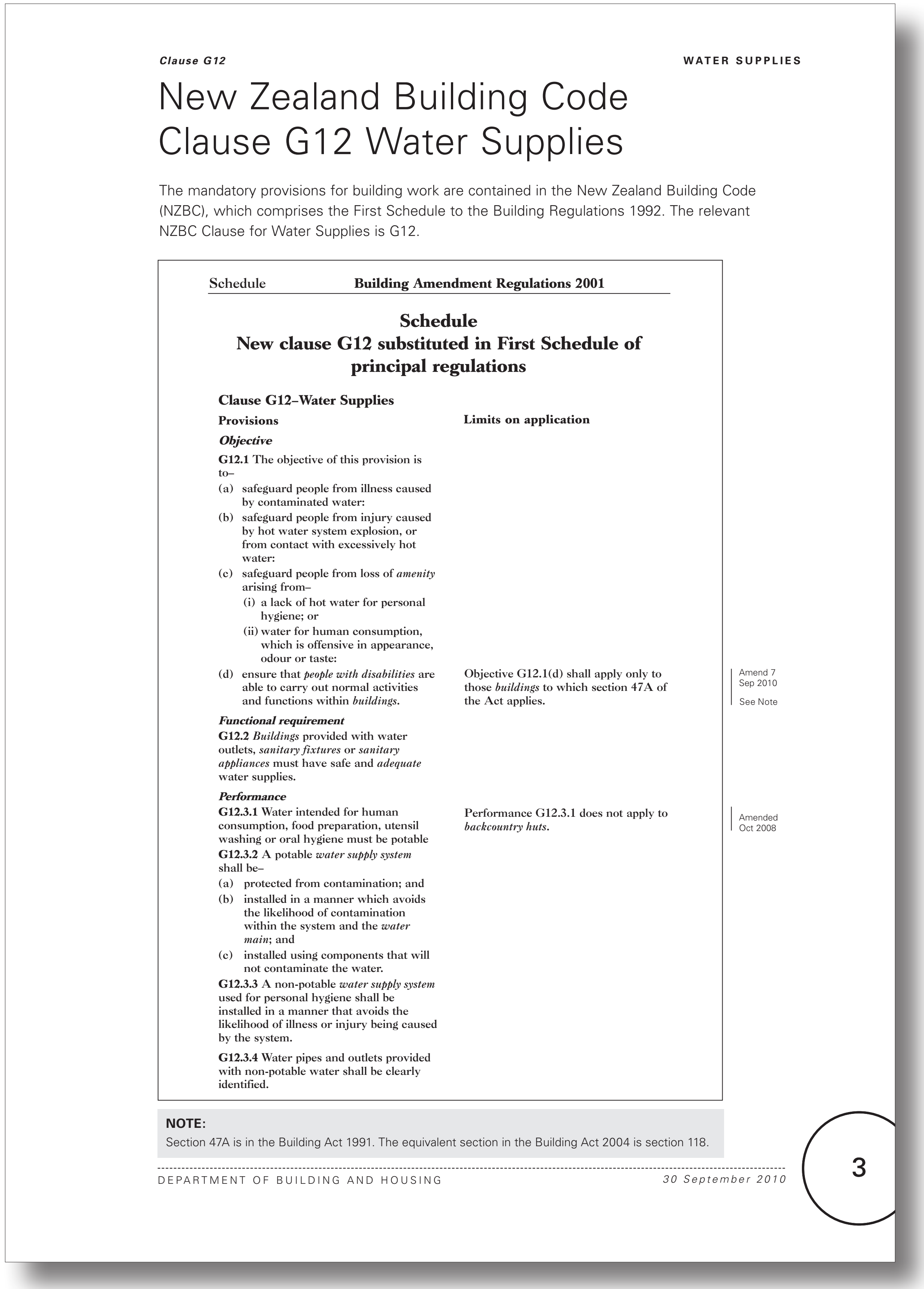
Clause G12–Water Supplies

Provisions	**Limits on application**	
Objective		
G12.1 The objective of this provision is to– (a) safeguard people from illness caused by contaminated water: (b) safeguard people from injury caused by hot water system explosion, or from contact with excessively hot water: (c) safeguard people from loss of *amenity* arising from– (i) a lack of hot water for personal hygiene; or (ii) water for human consumption, which is offensive in appearance, odour or taste:		
(d) ensure that *people with disabilities* are able to carry out normal activities and functions within *buildings*.	Objective G12.1(d) shall apply only to those *buildings* to which section 47A of the Act applies.	Amend 7 Sep 2010 See Note
Functional requirement		
G12.2 *Buildings* provided with water outlets, *sanitary fixtures* or *sanitary appliances* must have safe and *adequate* water supplies.		
Performance		
G12.3.1 Water intended for human consumption, food preparation, utensil washing or oral hygiene must be potable	Performance G12.3.1 does not apply to *backcountry huts*.	Amended Oct 2008
G12.3.2 A potable *water supply system* shall be– (a) protected from contamination; and (b) installed in a manner which avoids the likelihood of contamination within the system and the *water main*; and (c) installed using components that will not contaminate the water.		
G12.3.3 A non-potable *water supply system* used for personal hygiene shall be installed in a manner that avoids the likelihood of illness or injury being caused by the system.		
G12.3.4 Water pipes and outlets provided with non-potable water shall be clearly identified.		

NOTE:
Section 47A is in the Building Act 1991. The equivalent section in the Building Act 2004 is section 118.

DEPARTMENT OF BUILDING AND HOUSING 30 September 2010 3

Proposed G12 Water Supplies - No changes proposed to this page



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Clause G12–Water Supplies

Provisions / Limits on application

Objective

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(b) safeguard people from injury caused by hot water system explosion, or from contact with excessively hot water:
(c) safeguard people from loss of amenity arising from–
(i) a lack of hot water for personal hygiene; or
(ii) water for human consumption, which is offensive in appearance, odour or taste:
(d) ensure that people with disabilities are able to carry out normal activities and functions within buildings. — Objective G12.1(d) shall apply only to those buildings to which section 47A of the Act applies. — Amend 7 Sep 2010 See Note

Functional requirement

G12.2 Buildings provided with water outlets, sanitary fixtures or sanitary appliances must have safe and adequate water supplies.

Performance

G12.3.1 Water intended for human consumption, food preparation, utensil washing or oral hygiene must be potable — Performance G12.3.1 does not apply to backcountry huts. — Amended Oct 2008
G12.3.2 A potable water supply system shall be–
(a) protected from contamination; and
(b) installed in a manner which avoids the likelihood of contamination within the system and the water main; and
(c) installed using components that will not contaminate the water.
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NOTE:
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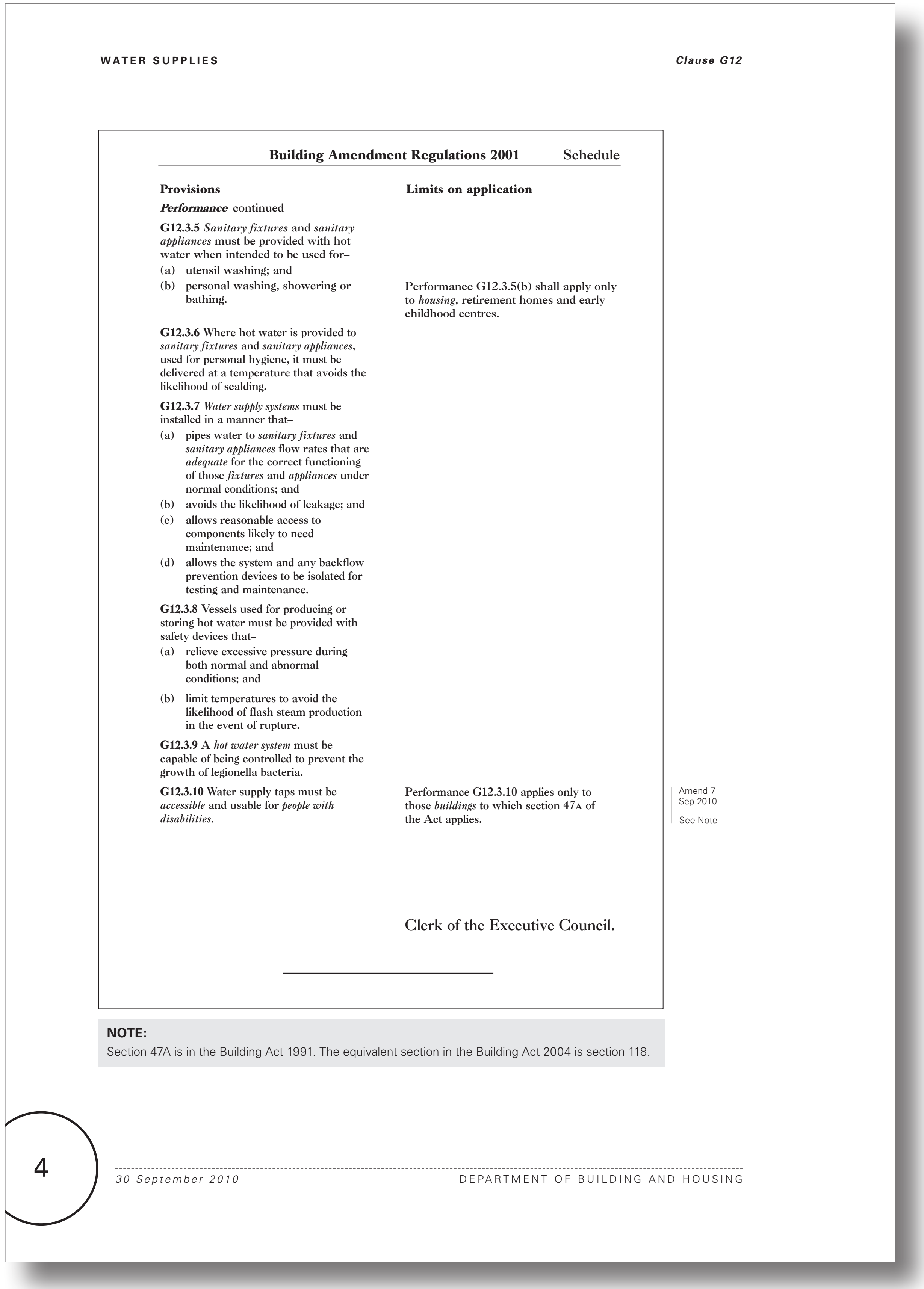
DEPARTMENT OF BUILDING AND HOUSING 30 September 2010 3

Current G12 Water Supplies - No changes proposed to this page



WATER SUPPLIES Clause G12

Building Amendment Regulations 2001 Schedule

Provisions	**Limits on application**
***Performance*–continued**	
G12.3.5 *Sanitary fixtures* and *sanitary appliances* must be provided with hot water when intended to be used for– (a) utensil washing; and (b) personal washing, showering or bathing.	Performance G12.3.5(b) shall apply only to *housing*, retirement homes and early childhood centres.
G12.3.6 Where hot water is provided to *sanitary fixtures* and *sanitary appliances*, used for personal hygiene, it must be delivered at a temperature that avoids the likelihood of scalding.	
G12.3.7 *Water supply systems* must be installed in a manner that– (a) pipes water to *sanitary fixtures* and *sanitary appliances* flow rates that are *adequate* for the correct functioning of those *fixtures* and *appliances* under normal conditions; and (b) avoids the likelihood of leakage; and (c) allows reasonable access to components likely to need maintenance; and (d) allows the system and any backflow prevention devices to be isolated for testing and maintenance.	
G12.3.8 Vessels used for producing or storing hot water must be provided with safety devices that– (a) relieve excessive pressure during both normal and abnormal conditions; and (b) limit temperatures to avoid the likelihood of flash steam production in the event of rupture.	
G12.3.9 A *hot water system* must be capable of being controlled to prevent the growth of legionella bacteria.	
G12.3.10 Water supply taps must be *accessible* and usable for *people with disabilities*.	Performance G12.3.10 applies only to those *buildings* to which section 47A of the Act applies.

Amend 7
Sep 2010
See Note

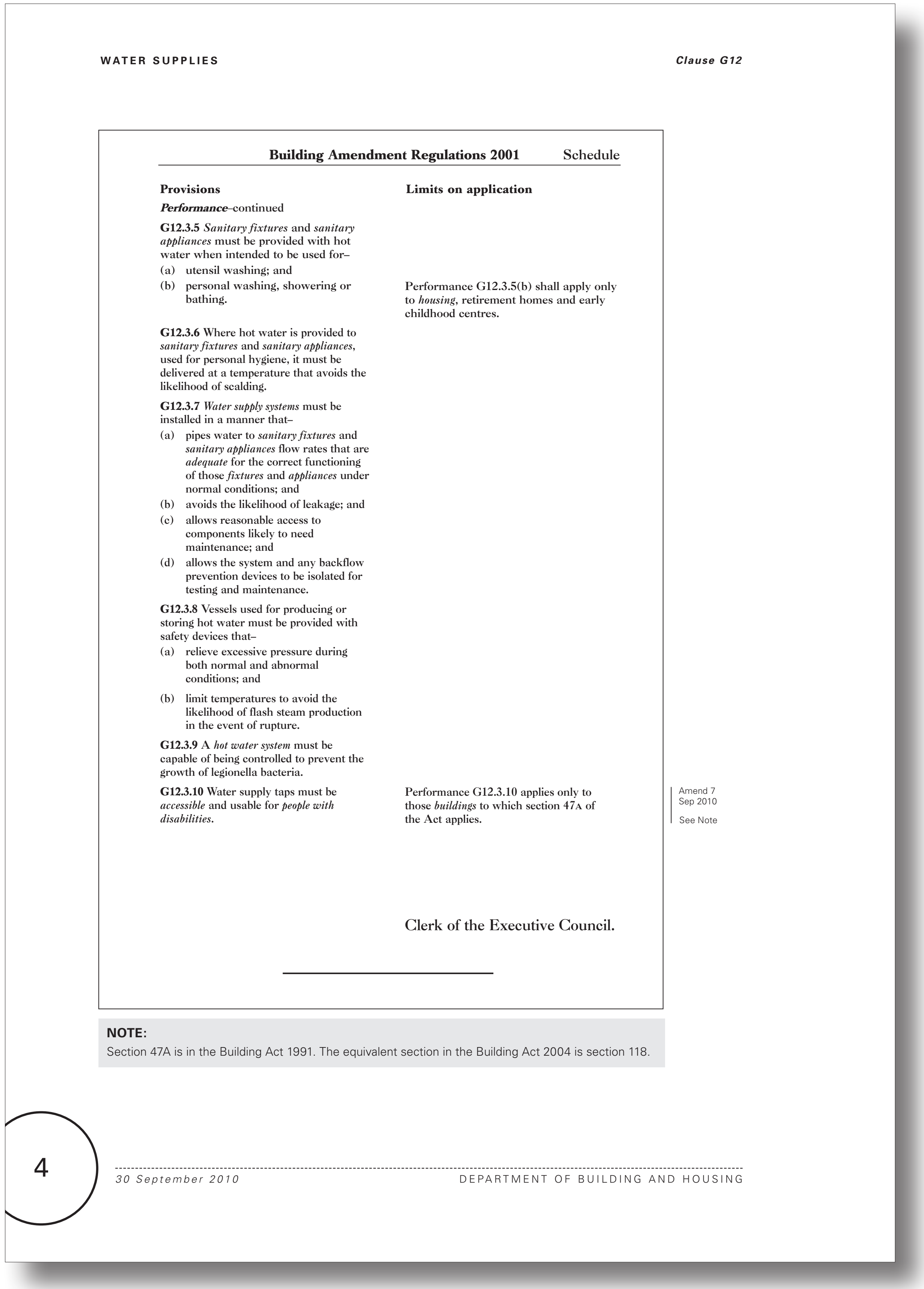
Clerk of the Executive Council.

NOTE:
Section 47A is in the Building Act 1991. The equivalent section in the Building Act 2004 is section 118.

4

30 September 2010 DEPARTMENT OF BUILDING AND HOUSING

Proposed G12 Water Supplies - No changes proposed to this page



WATER SUPPLIES Clause G12

Building Amendment Regulations 2001 Schedule

Provisions | Limits on application
Performance–continued
G12.3.5 Sanitary fixtures and sanitary appliances must be provided with hot water when intended to be used for– (a) utensil washing; and (b) personal washing, showering or bathing. | Performance G12.3.5(b) shall apply only to housing, retirement homes and early childhood centres.
G12.3.6 Where hot water is provided to sanitary fixtures and sanitary appliances, used for personal hygiene, it must be delivered at a temperature that avoids the likelihood of scalding.
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G12.3.9 A hot water system must be capable of being controlled to prevent the growth of legionella bacteria.
G12.3.10 Water supply taps must be accessible and usable for people with disabilities. | Performance G12.3.10 applies only to those buildings to which section 47A of the Act applies.

Amend 7 Sep 2010 See Note

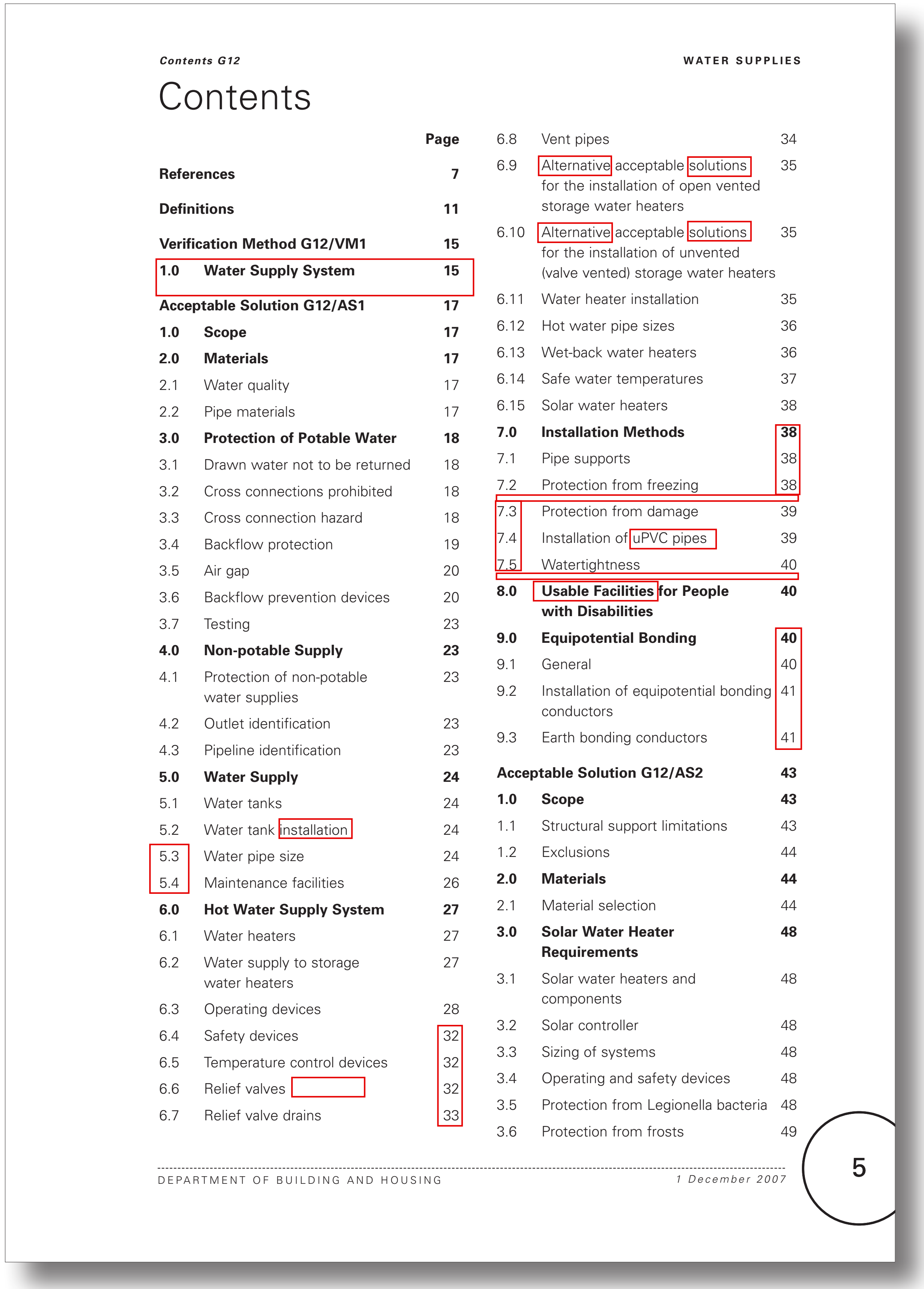
Clerk of the Executive Council.

NOTE:
Section 47A is in the Building Act 1991. The equivalent section in the Building Act 2004 is section 118.

4

30 September 2010 DEPARTMENT OF BUILDING AND HOUSING

Current G12 Water Supplies acceptable solutions and verification methods (Text to be amended shown in red)



Contents G12 WATER SUPPLIES

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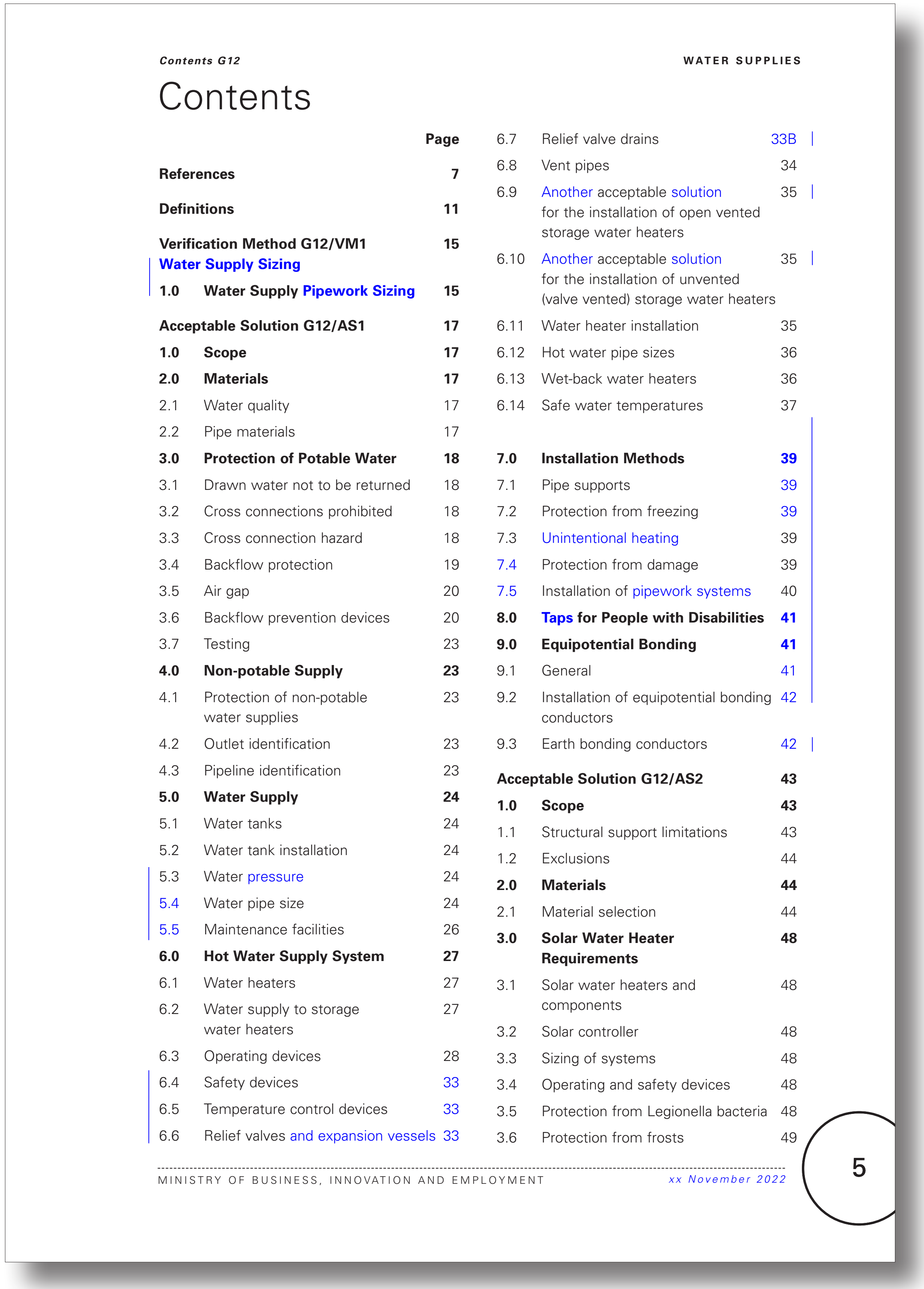
DEPARTMENT OF BUILDING AND HOUSING *1 December 2007* 5

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



Contents G12 WATER SUPPLIES

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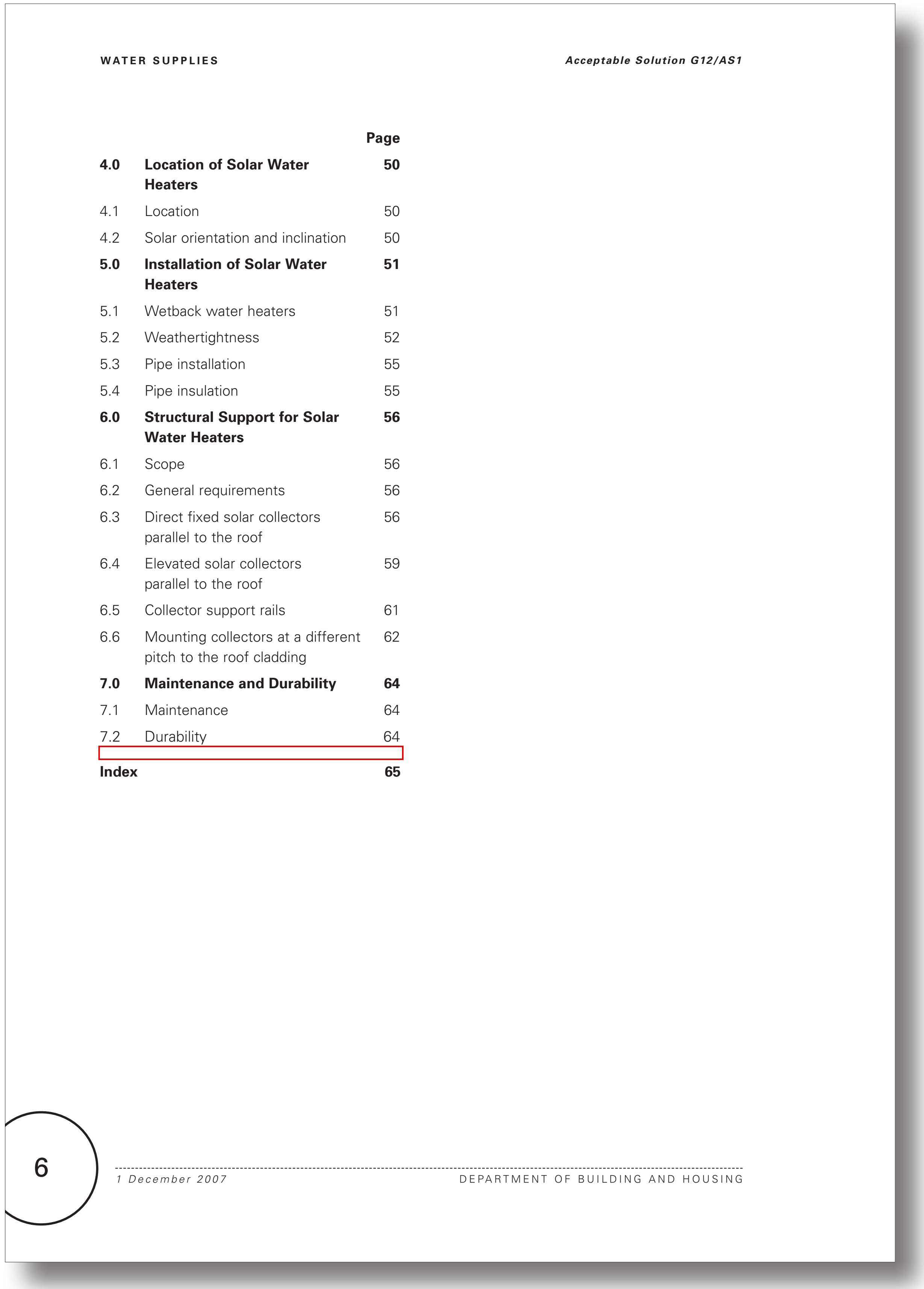
Appendix B. Proposed changes to the acceptable solutions and verification methods for clause G12 Water Supplies

Current G12 Water Supplies acceptable solutions and verification methods (Text to be amended shown in red)



WATER SUPPLIES

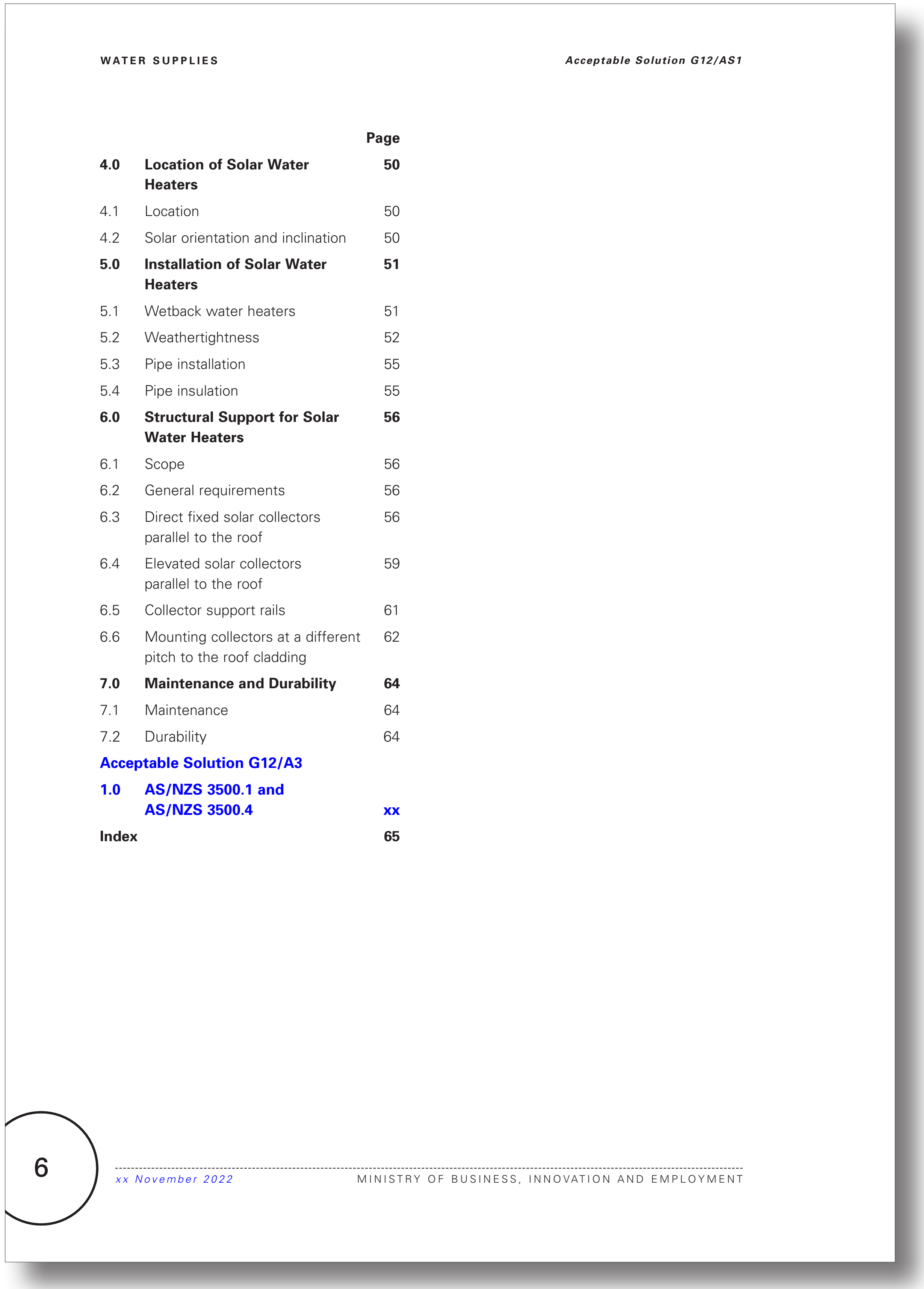
Acceptable Solution G12/AS1

6

1 December 2007

DEPARTMENT OF BUILDING AND HOUSING

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



WATER SUPPLIES

Acceptable Solution G12/AS1

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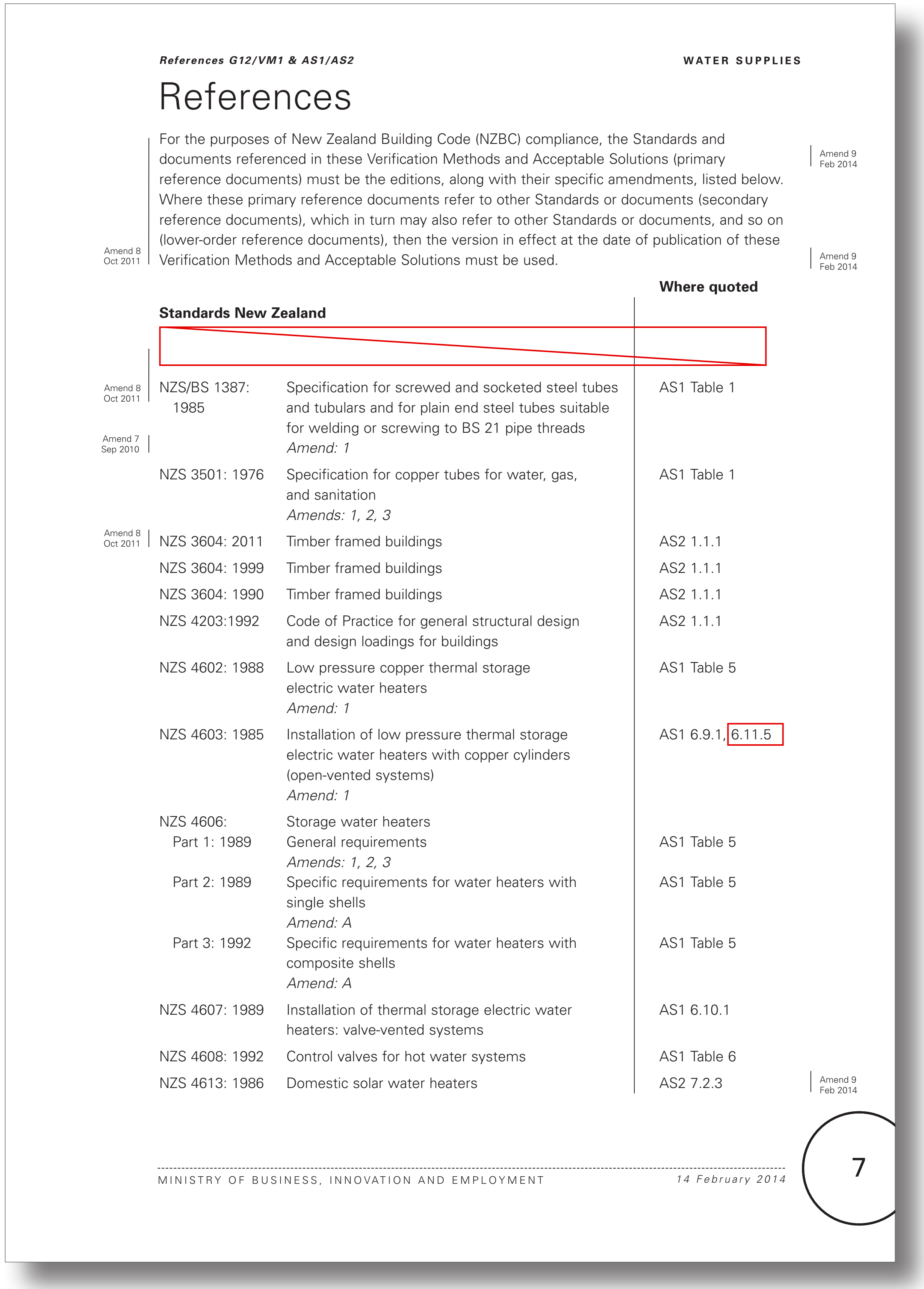
xx November 2022

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Appendix B. Proposed changes to the acceptable solutions and verification methods for clause G12 Water Supplies

Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



References G12/VM1 & AS1/AS2 **WATER SUPPLIES**

References

For the purposes of New Zealand Building Code (NZBC) compliance, the Standards and documents referenced in these Verification Methods and Acceptable Solutions (primary reference documents) must be the editions, along with their specific amendments, listed below. Where these primary reference documents refer to other Standards or documents (secondary reference documents), which in turn may also refer to other Standards or documents, and so on (lower-order reference documents), then the version in effect at the date of publication of these Verification Methods and Acceptable Solutions must be used.

Amend 9 Feb 2014

Amend 8 Oct 2011

Amend 9 Feb 2014

			Where quoted	
	Standards New Zealand			
Amend 8 Oct 2011 Amend 7 Sep 2010	NZS/BS 1387: 1985	Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or screwing to BS 21 pipe threads *Amend: 1*	AS1 Table 1	
	NZS 3501: 1976	Specification for copper tubes for water, gas, and sanitation *Amends: 1, 2, 3*	AS1 Table 1	
Amend 8 Oct 2011	NZS 3604: 2011	Timber framed buildings	AS2 1.1.1	
	NZS 3604: 1999	Timber framed buildings	AS2 1.1.1	
	NZS 3604: 1990	Timber framed buildings	AS2 1.1.1	
	NZS 4203:1992	Code of Practice for general structural design and design loadings for buildings	AS2 1.1.1	
	NZS 4602: 1988	Low pressure copper thermal storage electric water heaters *Amend: 1*	AS1 Table 5	
	NZS 4603: 1985	Installation of low pressure thermal storage electric water heaters with copper cylinders (open-vented systems) *Amend: 1*	AS1 6.9.1, 6.11.5	
	NZS 4606:	Storage water heaters		
	Part 1: 1989	General requirements *Amends: 1, 2, 3*	AS1 Table 5	
	Part 2: 1989	Specific requirements for water heaters with single shells *Amend: A*	AS1 Table 5	
	Part 3: 1992	Specific requirements for water heaters with composite shells *Amend: A*	AS1 Table 5	
	NZS 4607: 1989	Installation of thermal storage electric water heaters: valve-vented systems	AS1 6.10.1	
	NZS 4608: 1992	Control valves for hot water systems	AS1 Table 6	
	NZS 4613: 1986	Domestic solar water heaters	AS2 7.2.3	Amend 9 Feb 2014

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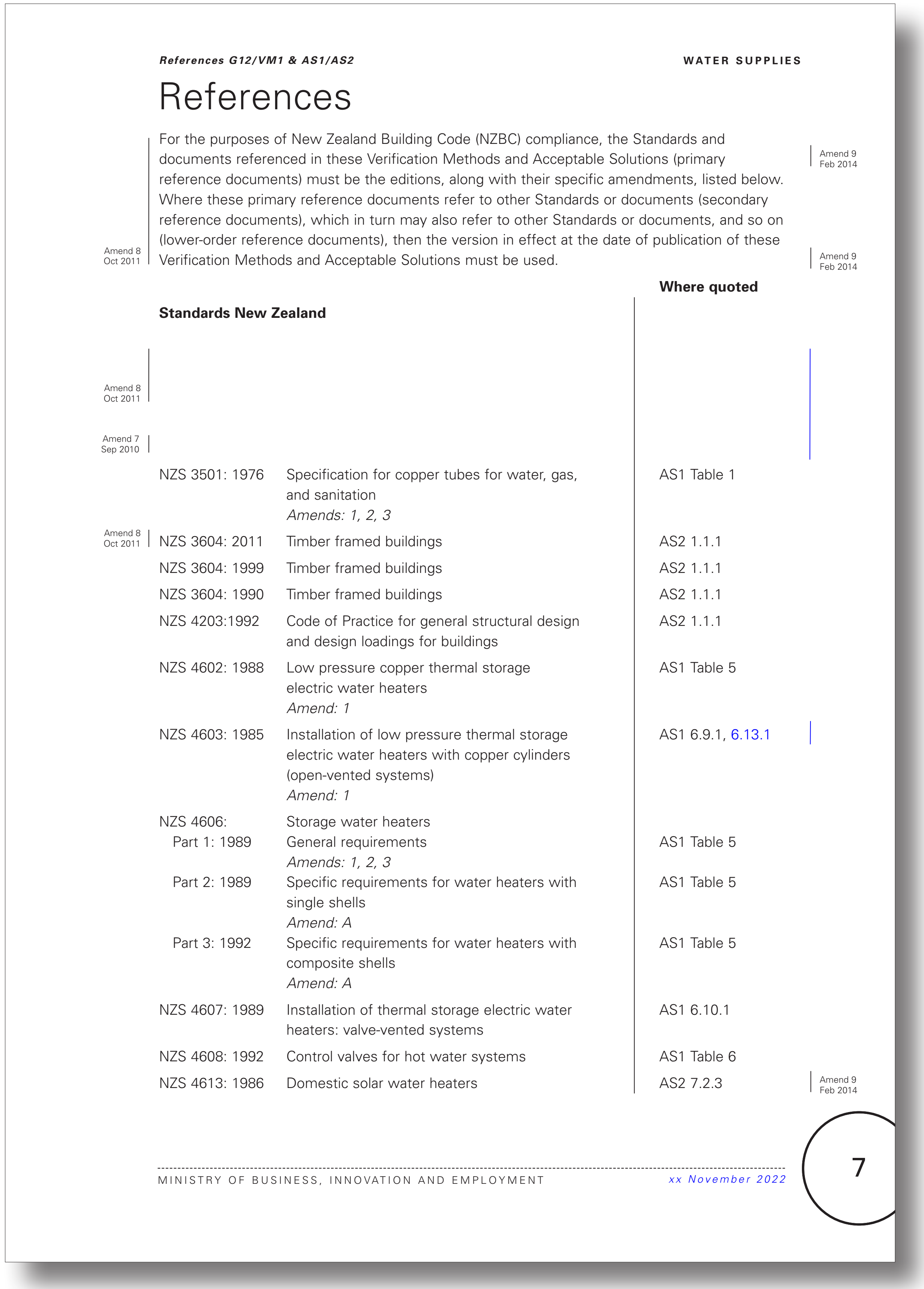
Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



References G12/VM1 & AS1/AS2 **WATER SUPPLIES**

References

For the purposes of New Zealand Building Code (NZBC) compliance, the Standards and documents referenced in these Verification Methods and Acceptable Solutions (primary reference documents) must be the editions, along with their specific amendments, listed below. Where these primary reference documents refer to other Standards or documents (secondary reference documents), which in turn may also refer to other Standards or documents, and so on (lower-order reference documents), then the version in effect at the date of publication of these Verification Methods and Acceptable Solutions must be used.

Amend 9 Feb 2014

Amend 8 Oct 2011

Amend 9 Feb 2014

			Where quoted	
	Standards New Zealand			
Amend 8 Oct 2011 Amend 7 Sep 2010				
	NZS 3501: 1976	Specification for copper tubes for water, gas, and sanitation *Amends: 1, 2, 3*	AS1 Table 1	
Amend 8 Oct 2011	NZS 3604: 2011	Timber framed buildings	AS2 1.1.1	
	NZS 3604: 1999	Timber framed buildings	AS2 1.1.1	
	NZS 3604: 1990	Timber framed buildings	AS2 1.1.1	
	NZS 4203:1992	Code of Practice for general structural design and design loadings for buildings	AS2 1.1.1	
	NZS 4602: 1988	Low pressure copper thermal storage electric water heaters *Amend: 1*	AS1 Table 5	
	NZS 4603: 1985	Installation of low pressure thermal storage electric water heaters with copper cylinders (open-vented systems) *Amend: 1*	AS1 6.9.1, 6.13.1	
	NZS 4606:	Storage water heaters		
	Part 1: 1989	General requirements *Amends: 1, 2, 3*	AS1 Table 5	
	Part 2: 1989	Specific requirements for water heaters with single shells *Amend: A*	AS1 Table 5	
	Part 3: 1992	Specific requirements for water heaters with composite shells *Amend: A*	AS1 Table 5	
	NZS 4607: 1989	Installation of thermal storage electric water heaters: valve-vented systems	AS1 6.10.1	
	NZS 4608: 1992	Control valves for hot water systems	AS1 Table 6	
	NZS 4613: 1986	Domestic solar water heaters	AS2 7.2.3	Amend 9 Feb 2014

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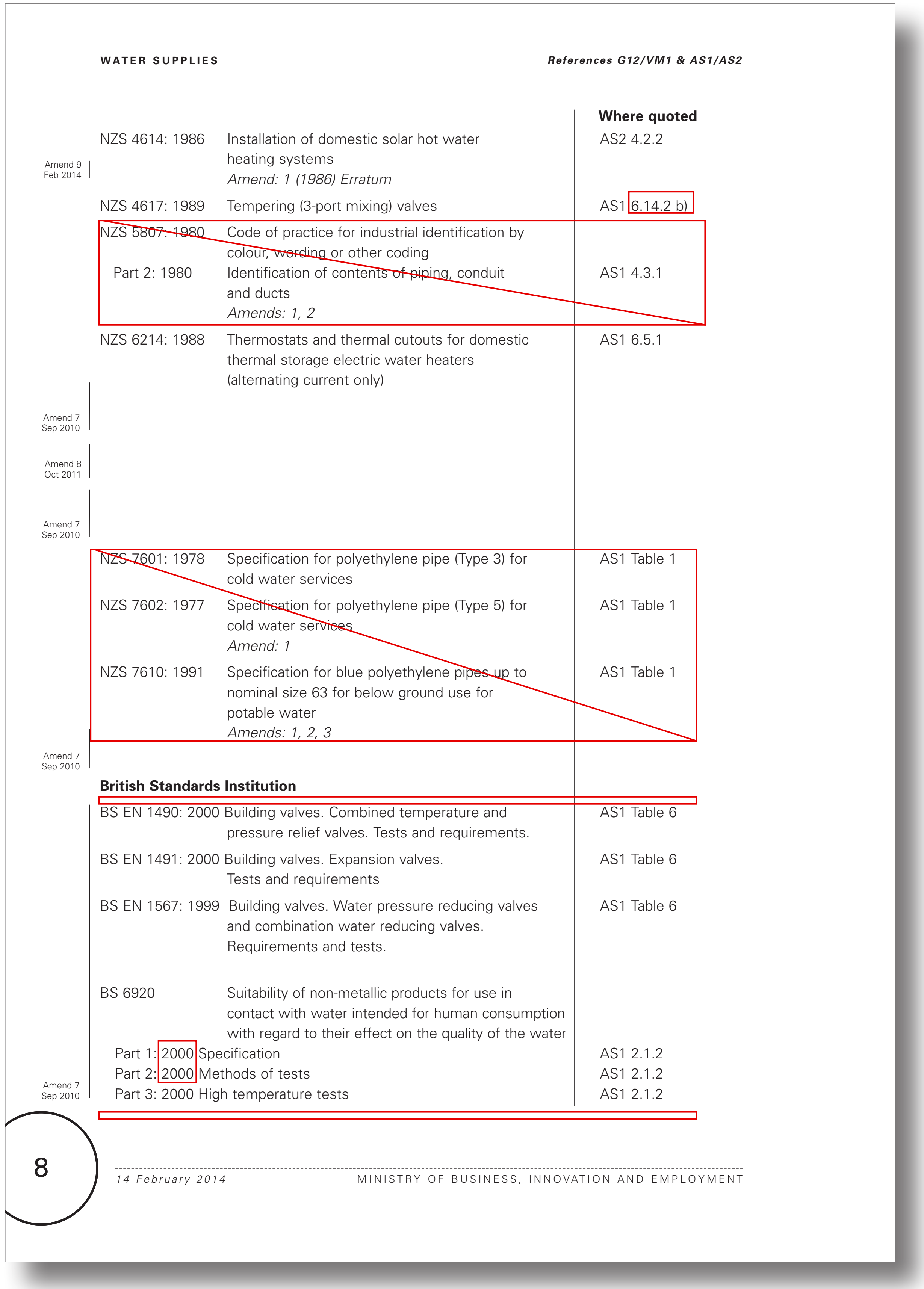
Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



WATER SUPPLIES

References G12/VM1 & AS1/AS2

Amend 9 Feb 2014

		Where quoted
NZS 4614: 1986	Installation of domestic solar hot water heating systems *Amend: 1 (1986) Erratum*	AS2 4.2.2
NZS 4617: 1989	Tempering (3-port mixing) valves	AS1 6.14.2 b)
~~NZS 5807: 1980~~	~~Code of practice for industrial identification by colour, wording or other coding~~	
~~Part 2: 1980~~	~~Identification of contents of piping, conduit and ducts~~ ~~*Amends: 1, 2*~~	~~AS1 4.3.1~~
NZS 6214: 1988	Thermostats and thermal cutouts for domestic thermal storage electric water heaters (alternating current only)	AS1 6.5.1

Amend 7 Sep 2010

Amend 8 Oct 2011

Amend 7 Sep 2010

~~NZS 7601: 1978~~	~~Specification for polyethylene pipe (Type 3) for cold water services~~	~~AS1 Table 1~~
~~NZS 7602: 1977~~	~~Specification for polyethylene pipe (Type 5) for cold water services~~ ~~*Amend: 1*~~	~~AS1 Table 1~~
~~NZS 7610: 1991~~	~~Specification for blue polyethylene pipes up to nominal size 63 for below ground use for potable water~~ ~~*Amends: 1, 2, 3*~~	~~AS1 Table 1~~

Amend 7 Sep 2010

British Standards Institution

BS EN 1490: 2000	Building valves. Combined temperature and pressure relief valves. Tests and requirements.	AS1 Table 6
BS EN 1491: 2000	Building valves. Expansion valves. Tests and requirements	AS1 Table 6
BS EN 1567: 1999	Building valves. Water pressure reducing valves and combination water reducing valves. Requirements and tests.	AS1 Table 6
BS 6920	Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water	
Part 1: 2000	Specification	AS1 2.1.2
Part 2: 2000	Methods of tests	AS1 2.1.2
Part 3: 2000	High temperature tests	AS1 2.1.2

Amend 7 Sep 2010

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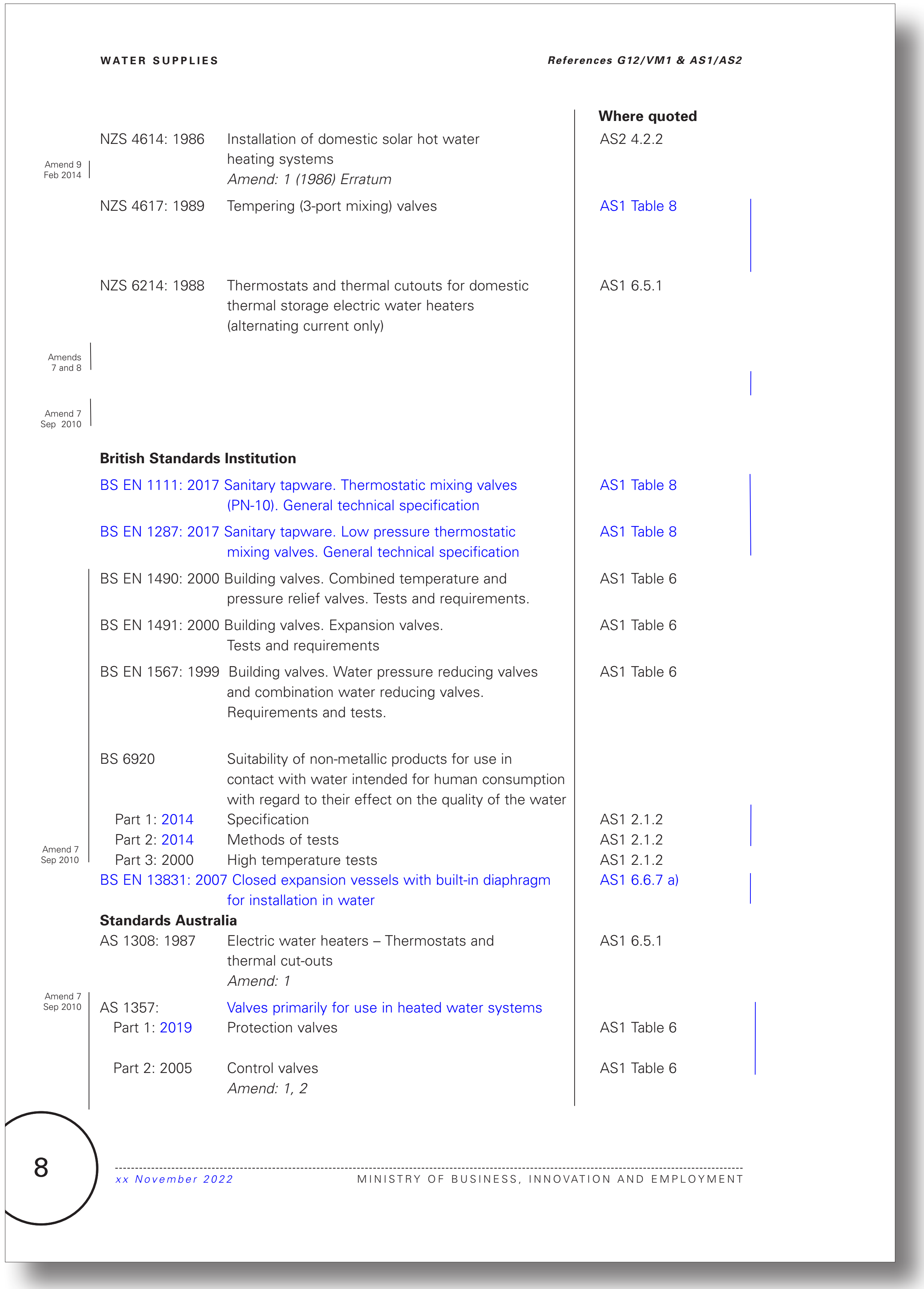
14 February 2014 MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



WATER SUPPLIES

References G12/VM1 & AS1/AS2

Amend 9 Feb 2014

		Where quoted
NZS 4614: 1986	Installation of domestic solar hot water heating systems *Amend: 1 (1986) Erratum*	AS2 4.2.2
NZS 4617: 1989	Tempering (3-port mixing) valves	AS1 Table 8
NZS 6214: 1988	Thermostats and thermal cutouts for domestic thermal storage electric water heaters (alternating current only)	AS1 6.5.1

Amends 7 and 8

Amend 7 Sep 2010

British Standards Institution

BS EN 1111: 2017	Sanitary tapware. Thermostatic mixing valves (PN-10). General technical specification	AS1 Table 8
BS EN 1287: 2017	Sanitary tapware. Low pressure thermostatic mixing valves. General technical specification	AS1 Table 8
BS EN 1490: 2000	Building valves. Combined temperature and pressure relief valves. Tests and requirements.	AS1 Table 6
BS EN 1491: 2000	Building valves. Expansion valves. Tests and requirements	AS1 Table 6
BS EN 1567: 1999	Building valves. Water pressure reducing valves and combination water reducing valves. Requirements and tests.	AS1 Table 6
BS 6920	Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water	
Part 1: 2014	Specification	AS1 2.1.2
Part 2: 2014	Methods of tests	AS1 2.1.2
Part 3: 2000	High temperature tests	AS1 2.1.2
BS EN 13831: 2007	Closed expansion vessels with built-in diaphragm for installation in water	AS1 6.6.7 a)

Amend 7 Sep 2010

Standards Australia

AS 1308: 1987	Electric water heaters – Thermostats and thermal cut-outs *Amend: 1*	AS1 6.5.1
AS 1357:	Valves primarily for use in heated water systems	
Part 1: 2019	Protection valves	AS1 Table 6
Part 2: 2005	Control valves *Amend: 1, 2*	AS1 Table 6

Amend 7 Sep 2010

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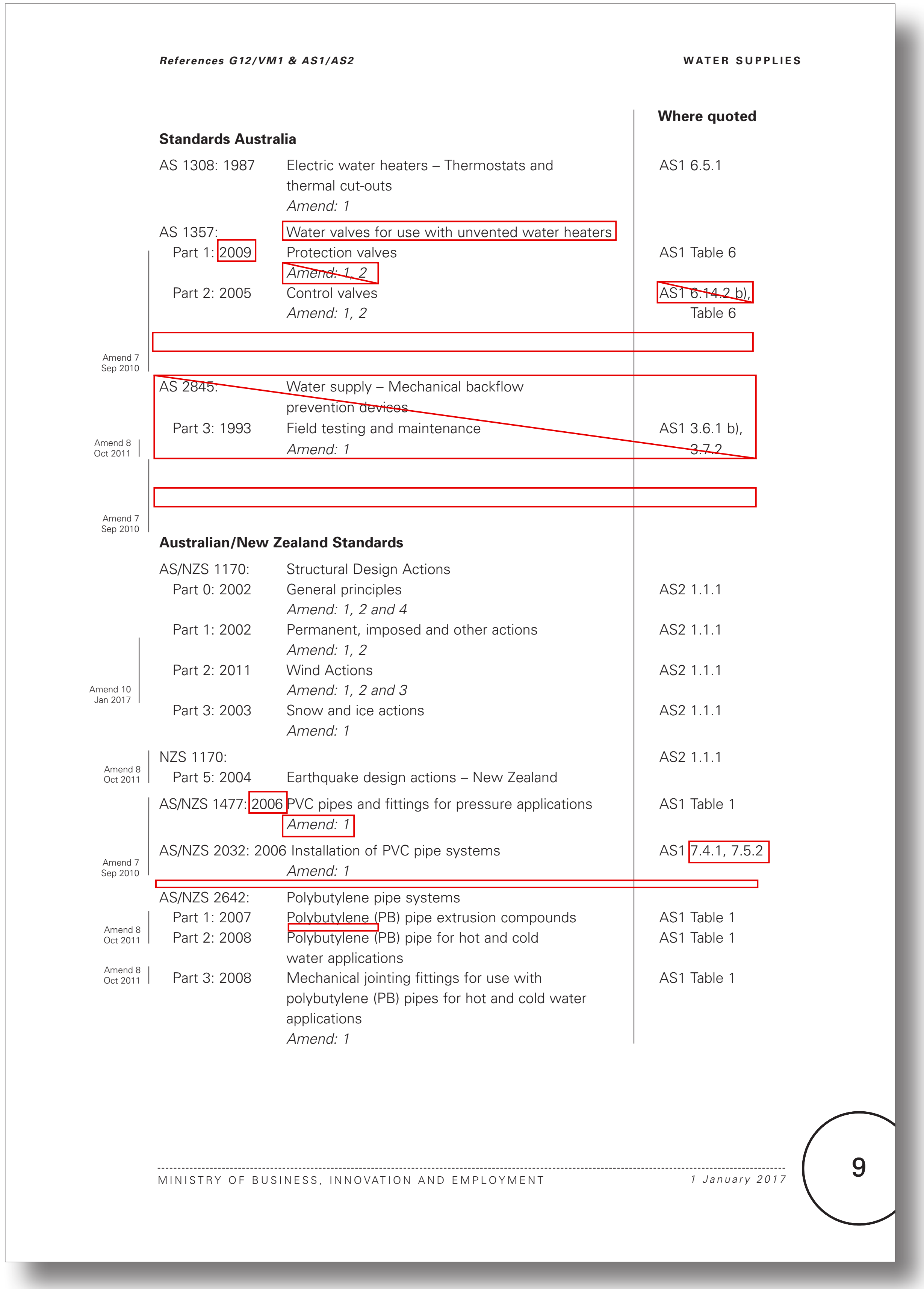
Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



References G12/VM1 & AS1/AS2 — **WATER SUPPLIES**

			Where quoted
	Standards Australia		
	AS 1308: 1987	Electric water heaters – Thermostats and thermal cut-outs *Amend: 1*	AS1 6.5.1
	AS 1357:	Water valves for use with unvented water heaters	
	Part 1: 2009	Protection valves ~~*Amend: 1, 2*~~	AS1 Table 6
	Part 2: 2005	Control valves *Amend: 1, 2*	~~AS1 6.14.2 b),~~ Table 6
Amend 7 Sep 2010			
	~~AS 2845:~~	~~Water supply – Mechanical backflow prevention devices~~	
Amend 8 Oct 2011	~~Part 3: 1993~~	~~Field testing and maintenance~~ ~~*Amend: 1*~~	~~AS1 3.6.1 b),~~ ~~3.7.2~~
Amend 7 Sep 2010			
	Australian/New Zealand Standards		
	AS/NZS 1170:	Structural Design Actions	
	Part 0: 2002	General principles *Amend: 1, 2 and 4*	AS2 1.1.1
	Part 1: 2002	Permanent, imposed and other actions *Amend: 1, 2*	AS2 1.1.1
Amend 10 Jan 2017	Part 2: 2011	Wind Actions *Amend: 1, 2 and 3*	AS2 1.1.1
	Part 3: 2003	Snow and ice actions *Amend: 1*	AS2 1.1.1
Amend 8 Oct 2011	NZS 1170:		AS2 1.1.1
	Part 5: 2004	Earthquake design actions – New Zealand	
	AS/NZS 1477: 2006	PVC pipes and fittings for pressure applications *Amend: 1*	AS1 Table 1
Amend 7 Sep 2010	AS/NZS 2032: 2006	Installation of PVC pipe systems *Amend: 1*	AS1 7.4.1, 7.5.2
	AS/NZS 2642:	Polybutylene pipe systems	
Amend 8 Oct 2011	Part 1: 2007	Polybutylene (PB) pipe extrusion compounds	AS1 Table 1
	Part 2: 2008	Polybutylene (PB) pipe for hot and cold water applications	AS1 Table 1
Amend 8 Oct 2011	Part 3: 2008	Mechanical jointing fittings for use with polybutylene (PB) pipes for hot and cold water applications *Amend: 1*	AS1 Table 1

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT — *1 January 2017*

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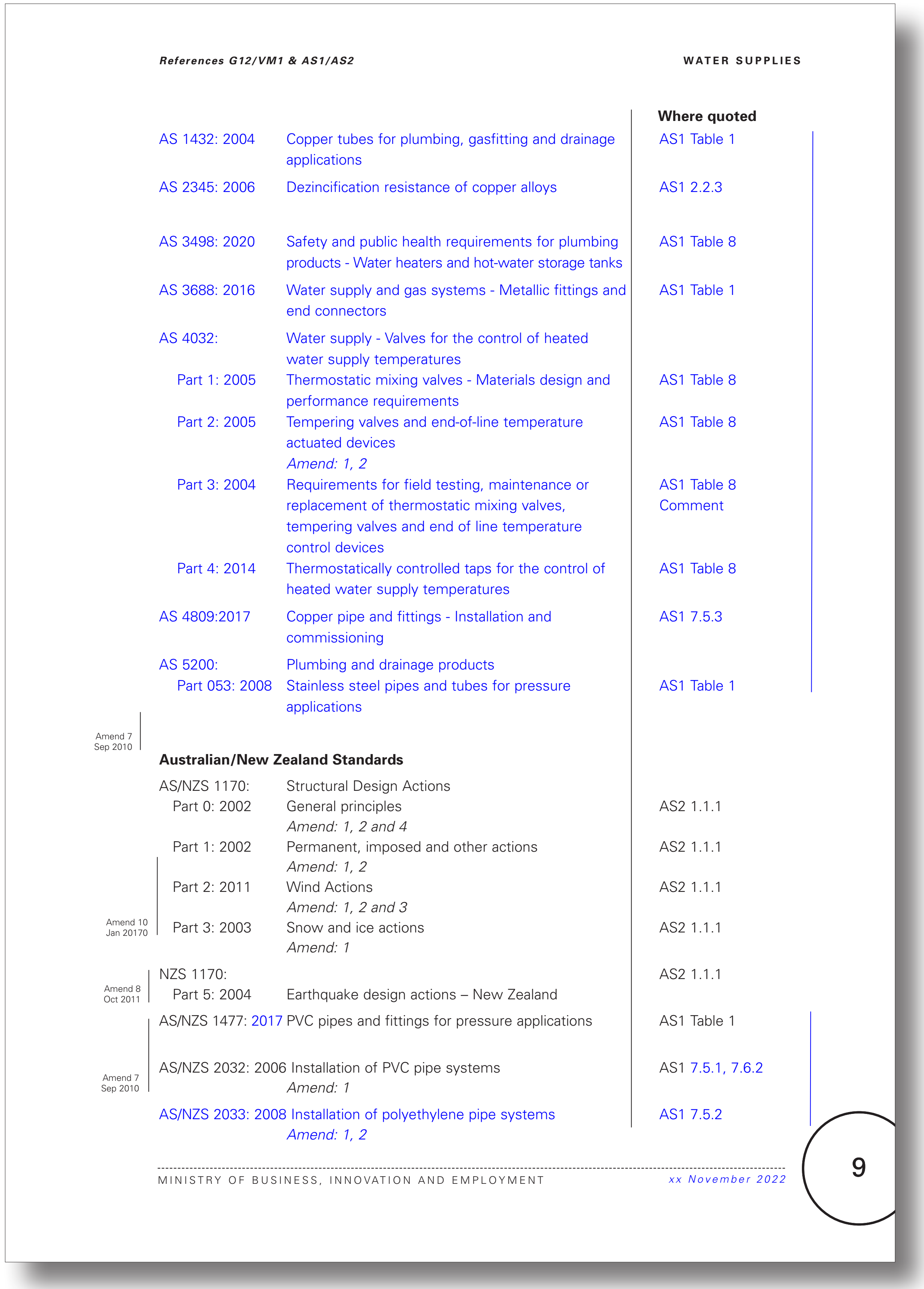
Proposed amendments to G12 Water Supplies acceptable solutions and verification methods

(Proposed text in blue)



References G12/VM1 & AS1/AS2 — **WATER SUPPLIES**

			Where quoted
	AS 1432: 2004	Copper tubes for plumbing, gasfitting and drainage applications	AS1 Table 1
	AS 2345: 2006	Dezincification resistance of copper alloys	AS1 2.2.3
	AS 3498: 2020	Safety and public health requirements for plumbing products - Water heaters and hot-water storage tanks	AS1 Table 8
	AS 3688: 2016	Water supply and gas systems - Metallic fittings and end connectors	AS1 Table 1
	AS 4032:	Water supply - Valves for the control of heated water supply temperatures	
	Part 1: 2005	Thermostatic mixing valves - Materials design and performance requirements	AS1 Table 8
	Part 2: 2005	Tempering valves and end-of-line temperature actuated devices *Amend: 1, 2*	AS1 Table 8
	Part 3: 2004	Requirements for field testing, maintenance or replacement of thermostatic mixing valves, tempering valves and end of line temperature control devices	AS1 Table 8 Comment
	Part 4: 2014	Thermostatically controlled taps for the control of heated water supply temperatures	AS1 Table 8
	AS 4809:2017	Copper pipe and fittings - Installation and commissioning	AS1 7.5.3
	AS 5200:	Plumbing and drainage products	
	Part 053: 2008	Stainless steel pipes and tubes for pressure applications	AS1 Table 1
Amend 7 Sep 2010			
	Australian/New Zealand Standards		
	AS/NZS 1170:	Structural Design Actions	
	Part 0: 2002	General principles *Amend: 1, 2 and 4*	AS2 1.1.1
	Part 1: 2002	Permanent, imposed and other actions *Amend: 1, 2*	AS2 1.1.1
	Part 2: 2011	Wind Actions *Amend: 1, 2 and 3*	AS2 1.1.1
Amend 10 Jan 20170	Part 3: 2003	Snow and ice actions *Amend: 1*	AS2 1.1.1
	NZS 1170:		AS2 1.1.1
Amend 8 Oct 2011	Part 5: 2004	Earthquake design actions – New Zealand	
	AS/NZS 1477: 2017	PVC pipes and fittings for pressure applications	AS1 Table 1
Amend 7 Sep 2010	AS/NZS 2032: 2006	Installation of PVC pipe systems *Amend: 1*	AS1 7.5.1, 7.6.2
	AS/NZS 2033: 2008	Installation of polyethylene pipe systems *Amend: 1, 2*	AS1 7.5.2

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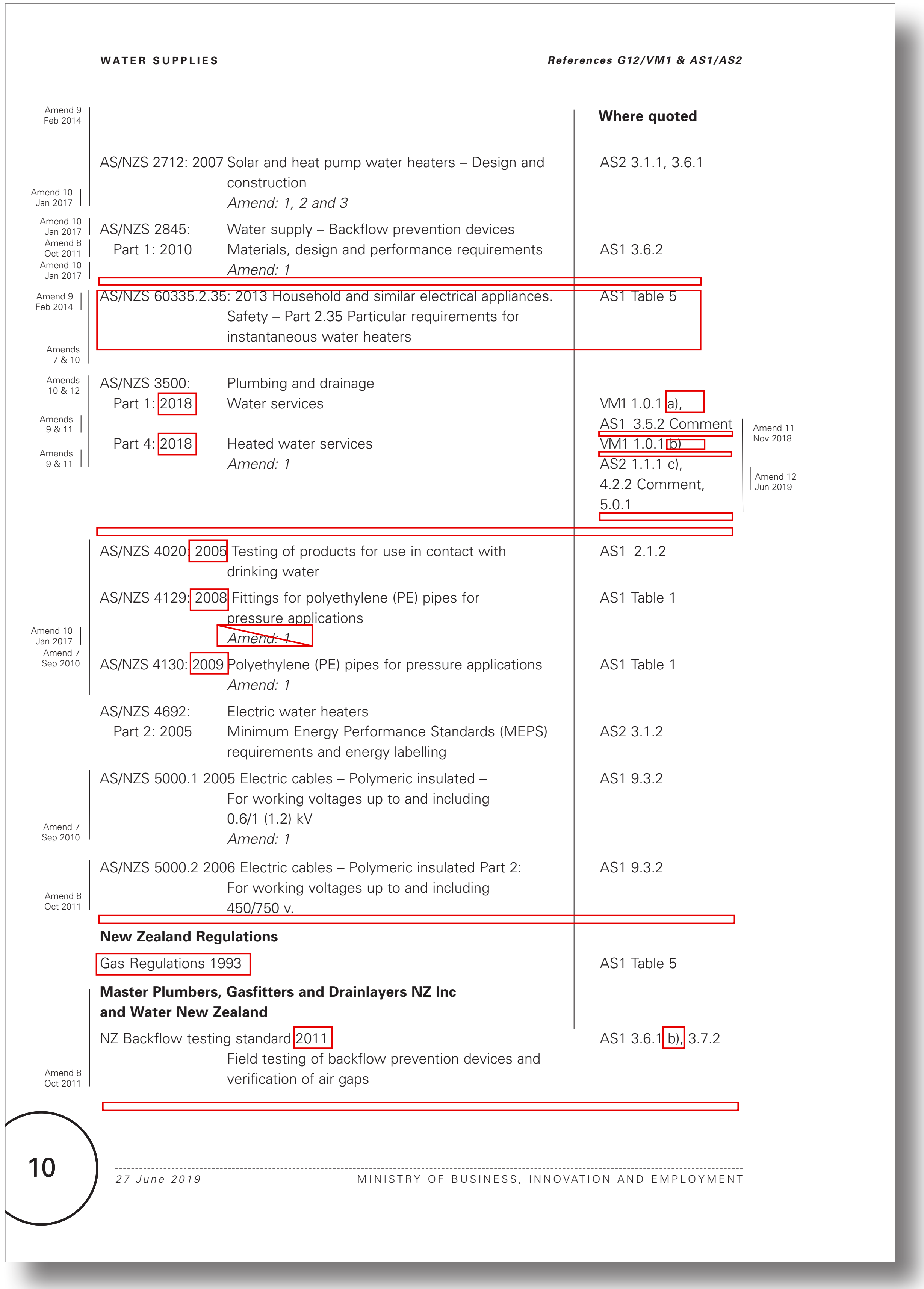
Appendix B. Proposed changes to the acceptable solutions and verification methods for clause G12 Water Supplies

Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



WATER SUPPLIES *References G12/VM1 & AS1/AS2*

			Where quoted
Amend 9 Feb 2014 Amend 10 Jan 2017	AS/NZS 2712: 2007	Solar and heat pump water heaters – Design and construction *Amend: 1, 2 and 3*	AS2 3.1.1, 3.6.1
Amend 10 Jan 2017 Amend 8 Oct 2011 Amend 10 Jan 2017	AS/NZS 2845: Part 1: 2010	Water supply – Backflow prevention devices Materials, design and performance requirements *Amend: 1*	AS1 3.6.2
Amend 9 Feb 2014 Amends 7 & 10	AS/NZS 60335.2.35: 2013	Household and similar electrical appliances. Safety – Part 2.35 Particular requirements for instantaneous water heaters	AS1 Table 5
Amends 10 & 12 Amends 9 & 11	AS/NZS 3500: Part 1: 2018	Plumbing and drainage Water services	VM1 1.0.1 a), AS1 3.5.2 Comment
Amends 9 & 11	Part 4: 2018	Heated water services *Amend: 1*	VM1 1.0.1 b) AS2 1.1.1 c), 4.2.2 Comment, 5.0.1 Amend 11 Nov 2018 Amend 12 Jun 2019
	AS/NZS 4020: 2005	Testing of products for use in contact with drinking water	AS1 2.1.2
Amend 10 Jan 2017	AS/NZS 4129: 2008	Fittings for polyethylene (PE) pipes for pressure applications ~~*Amend: 1*~~	AS1 Table 1
Amend 7 Sep 2010	AS/NZS 4130: 2009	Polyethylene (PE) pipes for pressure applications *Amend: 1*	AS1 Table 1
	AS/NZS 4692: Part 2: 2005	Electric water heaters Minimum Energy Performance Standards (MEPS) requirements and energy labelling	AS2 3.1.2
Amend 7 Sep 2010	AS/NZS 5000.1 2005	Electric cables – Polymeric insulated – For working voltages up to and including 0.6/1 (1.2) kV *Amend: 1*	AS1 9.3.2
Amend 8 Oct 2011	AS/NZS 5000.2 2006	Electric cables – Polymeric insulated Part 2: For working voltages up to and including 450/750 v.	AS1 9.3.2
	New Zealand Regulations		
	Gas Regulations 1993		AS1 Table 5
	Master Plumbers, Gasfitters and Drainlayers NZ Inc and Water New Zealand		
Amend 8 Oct 2011	NZ Backflow testing standard 2011	Field testing of backflow prevention devices and verification of air gaps	AS1 3.6.1 b), 3.7.2

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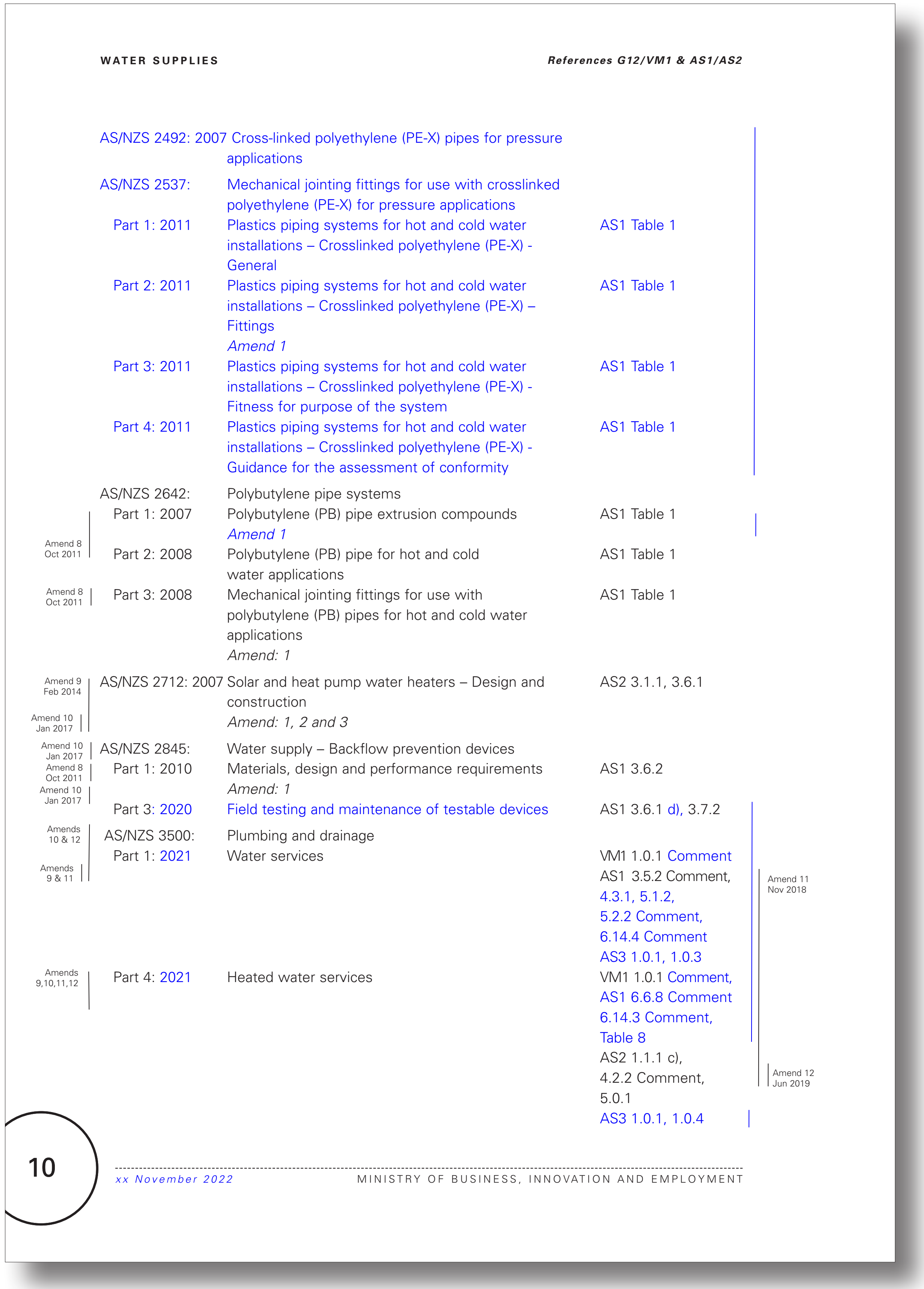
27 June 2019 MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods

(Proposed text in blue)



WATER SUPPLIES *References G12/VM1 & AS1/AS2*

	AS/NZS 2492: 2007	Cross-linked polyethylene (PE-X) pipes for pressure applications	
	AS/NZS 2537:	Mechanical jointing fittings for use with crosslinked polyethylene (PE-X) for pressure applications	
	Part 1: 2011	Plastics piping systems for hot and cold water installations – Crosslinked polyethylene (PE-X) - General	AS1 Table 1
	Part 2: 2011	Plastics piping systems for hot and cold water installations – Crosslinked polyethylene (PE-X) – Fittings *Amend 1*	AS1 Table 1
	Part 3: 2011	Plastics piping systems for hot and cold water installations – Crosslinked polyethylene (PE-X) - Fitness for purpose of the system	AS1 Table 1
	Part 4: 2011	Plastics piping systems for hot and cold water installations – Crosslinked polyethylene (PE-X) - Guidance for the assessment of conformity	AS1 Table 1
	AS/NZS 2642:	Polybutylene pipe systems	
Amend 8 Oct 2011	Part 1: 2007	Polybutylene (PB) pipe extrusion compounds *Amend 1*	AS1 Table 1
	Part 2: 2008	Polybutylene (PB) pipe for hot and cold water applications	AS1 Table 1
Amend 8 Oct 2011	Part 3: 2008	Mechanical jointing fittings for use with polybutylene (PB) pipes for hot and cold water applications *Amend: 1*	AS1 Table 1
Amend 9 Feb 2014 Amend 10 Jan 2017	AS/NZS 2712: 2007	Solar and heat pump water heaters – Design and construction *Amend: 1, 2 and 3*	AS2 3.1.1, 3.6.1
Amend 10 Jan 2017 Amend 8 Oct 2011 Amend 10 Jan 2017	AS/NZS 2845: Part 1: 2010	Water supply – Backflow prevention devices Materials, design and performance requirements *Amend: 1*	AS1 3.6.2
	Part 3: 2020	Field testing and maintenance of testable devices	AS1 3.6.1 d), 3.7.2
Amends 10 & 12 Amends 9 & 11	AS/NZS 3500: Part 1: 2021	Plumbing and drainage Water services	VM1 1.0.1 Comment AS1 3.5.2 Comment, 4.3.1, 5.1.2, 5.2.2 Comment, 6.14.4 Comment AS3 1.0.1, 1.0.3 Amend 11 Nov 2018
Amends 9,10,11,12	Part 4: 2021	Heated water services	VM1 1.0.1 Comment, AS1 6.6.8 Comment 6.14.3 Comment, Table 8 AS2 1.1.1 c), 4.2.2 Comment, 5.0.1 AS3 1.0.1, 1.0.4 Amend 12 Jun 2019

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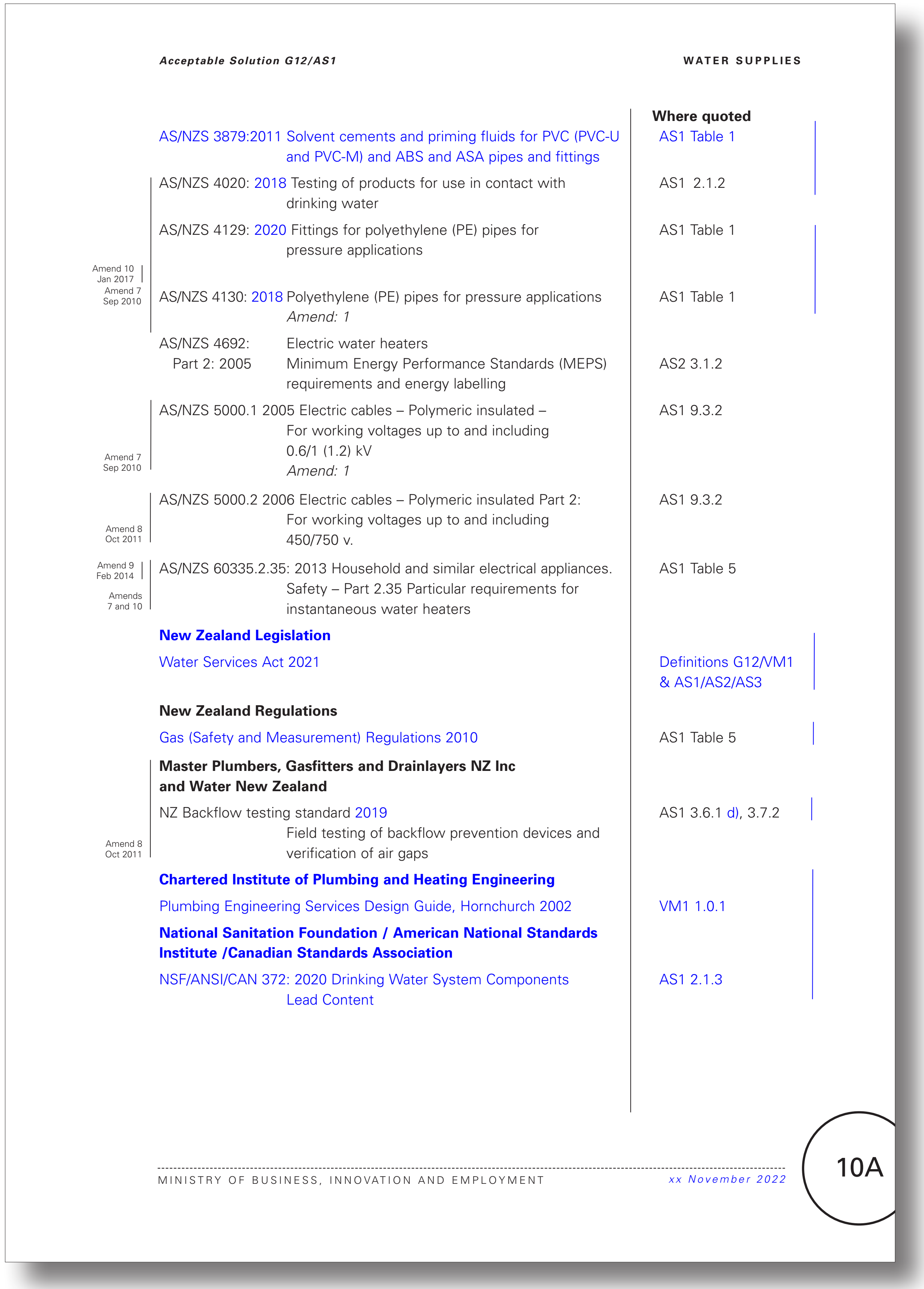
xx November 2022 MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



Acceptable Solution G12/AS1 WATER SUPPLIES

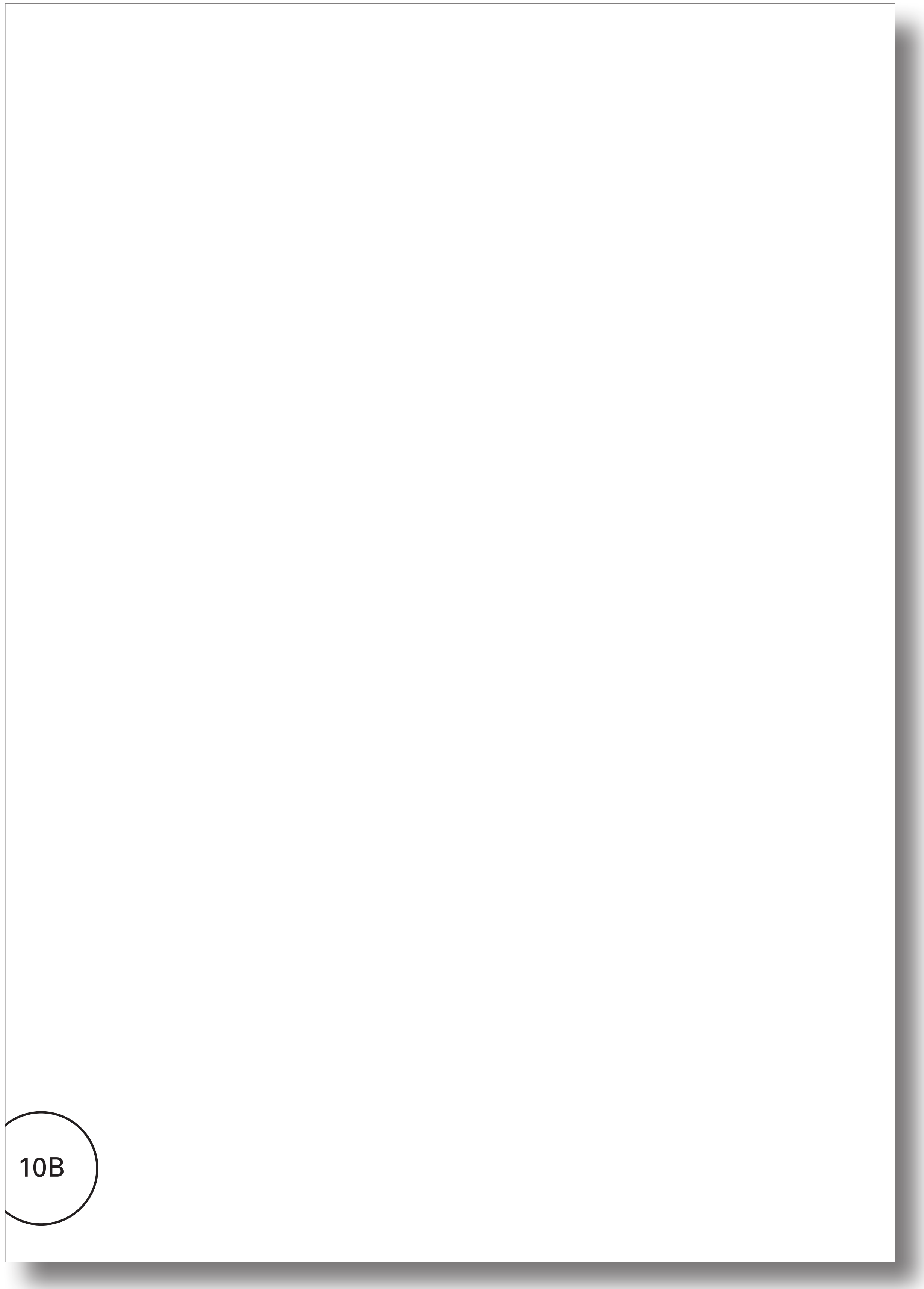
		Where quoted
	AS/NZS 3879:2011 Solvent cements and priming fluids for PVC (PVC-U and PVC-M) and ABS and ASA pipes and fittings	AS1 Table 1
	AS/NZS 4020: 2018 Testing of products for use in contact with drinking water	AS1 2.1.2
	AS/NZS 4129: 2020 Fittings for polyethylene (PE) pipes for pressure applications	AS1 Table 1
Amend 10 Jan 2017 Amend 7 Sep 2010	AS/NZS 4130: 2018 Polyethylene (PE) pipes for pressure applications *Amend: 1*	AS1 Table 1
	AS/NZS 4692: Electric water heaters Part 2: 2005 Minimum Energy Performance Standards (MEPS) requirements and energy labelling	AS2 3.1.2
Amend 7 Sep 2010	AS/NZS 5000.1 2005 Electric cables – Polymeric insulated – For working voltages up to and including 0.6/1 (1.2) kV *Amend: 1*	AS1 9.3.2
Amend 8 Oct 2011	AS/NZS 5000.2 2006 Electric cables – Polymeric insulated Part 2: For working voltages up to and including 450/750 v.	AS1 9.3.2
Amend 9 Feb 2014 Amends 7 and 10	AS/NZS 60335.2.35: 2013 Household and similar electrical appliances. Safety – Part 2.35 Particular requirements for instantaneous water heaters	AS1 Table 5
	New Zealand Legislation	
	Water Services Act 2021	Definitions G12/VM1 & AS1/AS2/AS3
	New Zealand Regulations	
	Gas (Safety and Measurement) Regulations 2010	AS1 Table 5
	Master Plumbers, Gasfitters and Drainlayers NZ Inc and Water New Zealand	
Amend 8 Oct 2011	NZ Backflow testing standard 2019 Field testing of backflow prevention devices and verification of air gaps	AS1 3.6.1 d), 3.7.2
	Chartered Institute of Plumbing and Heating Engineering	
	Plumbing Engineering Services Design Guide, Hornchurch 2002	VM1 1.0.1
	National Sanitation Foundation / American National Standards Institute /Canadian Standards Association	
	NSF/ANSI/CAN 372: 2020 Drinking Water System Components Lead Content	AS1 2.1.3

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT *xx November 2022*

10A

Current G12 Water Supplies acceptable solutions and verification methods (Text to be amended shown in red)

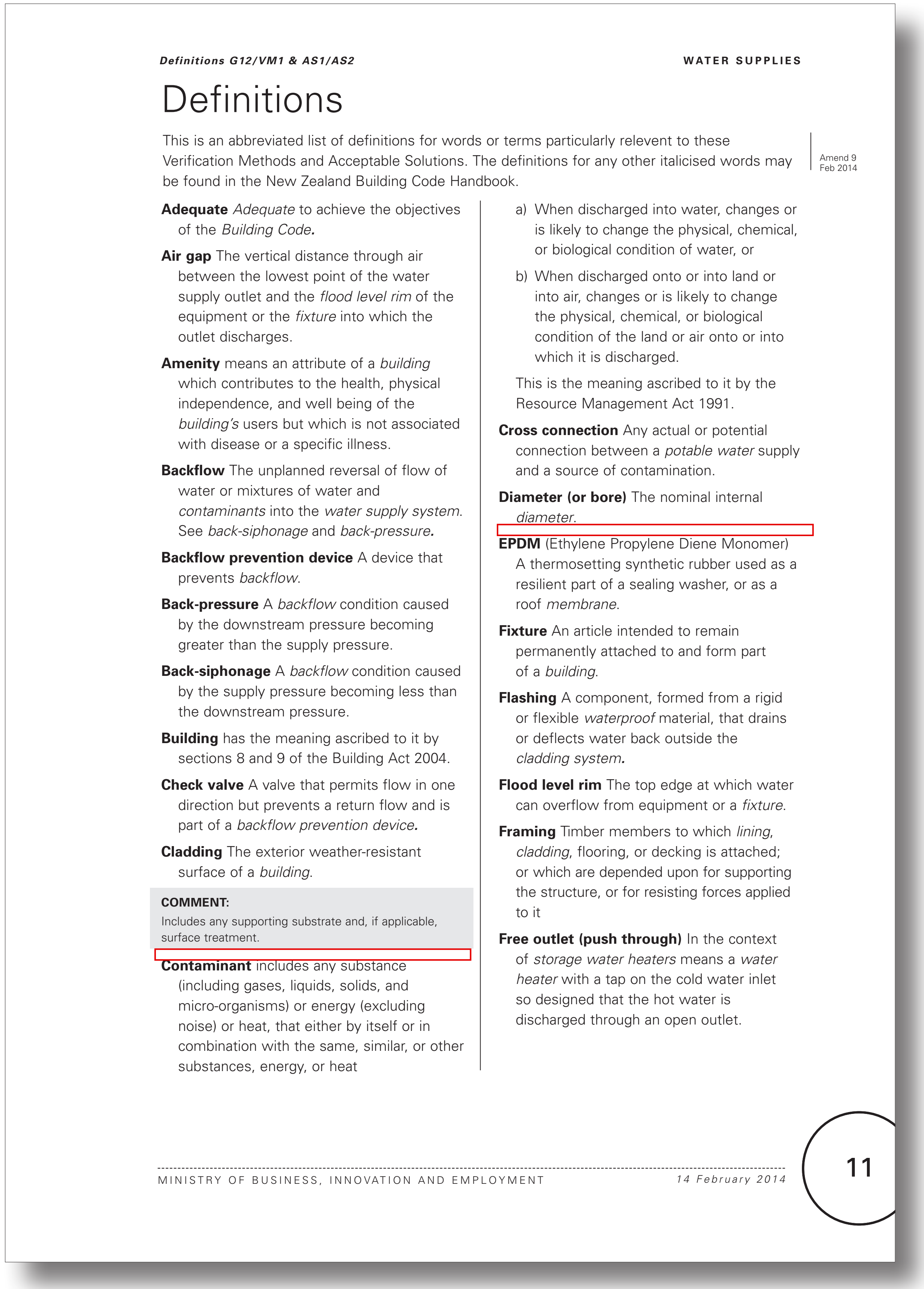
Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



10B

Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



Definitions G12/VM1 & AS1/AS2 WATER SUPPLIES

Definitions

This is an abbreviated list of definitions for words or terms particularly relevent to these Verification Methods and Acceptable Solutions. The definitions for any other italicised words may be found in the New Zealand Building Code Handbook.

Amend 9 Feb 2014

Adequate *Adequate* to achieve the objectives of the *Building Code*.

Air gap The vertical distance through air between the lowest point of the water supply outlet and the *flood level rim* of the equipment or the *fixture* into which the outlet discharges.

Amenity means an attribute of a *building* which contributes to the health, physical independence, and well being of the *building's* users but which is not associated with disease or a specific illness.

Backflow The unplanned reversal of flow of water or mixtures of water and *contaminants* into the *water supply system*. See *back-siphonage* and *back-pressure*.

Backflow prevention device A device that prevents *backflow*.

Back-pressure A *backflow* condition caused by the downstream pressure becoming greater than the supply pressure.

Back-siphonage A *backflow* condition caused by the supply pressure becoming less than the downstream pressure.

Building has the meaning ascribed to it by sections 8 and 9 of the Building Act 2004.

Check valve A valve that permits flow in one direction but prevents a return flow and is part of a *backflow prevention device*.

Cladding The exterior weather-resistant surface of a *building*.

COMMENT:
Includes any supporting substrate and, if applicable, surface treatment.

Contaminant includes any substance (including gases, liquids, solids, and micro-organisms) or energy (excluding noise) or heat, that either by itself or in combination with the same, similar, or other substances, energy, or heat

a) When discharged into water, changes or is likely to change the physical, chemical, or biological condition of water, or

b) When discharged onto or into land or into air, changes or is likely to change the physical, chemical, or biological condition of the land or air onto or into which it is discharged.

This is the meaning ascribed to it by the Resource Management Act 1991.

Cross connection Any actual or potential connection between a *potable water* supply and a source of contamination.

Diameter (or bore) The nominal internal *diameter*.

EPDM (Ethylene Propylene Diene Monomer) A thermosetting synthetic rubber used as a resilient part of a sealing washer, or as a roof *membrane*.

Fixture An article intended to remain permanently attached to and form part of a *building*.

Flashing A component, formed from a rigid or flexible *waterproof* material, that drains or deflects water back outside the *cladding system*.

Flood level rim The top edge at which water can overflow from equipment or a *fixture*.

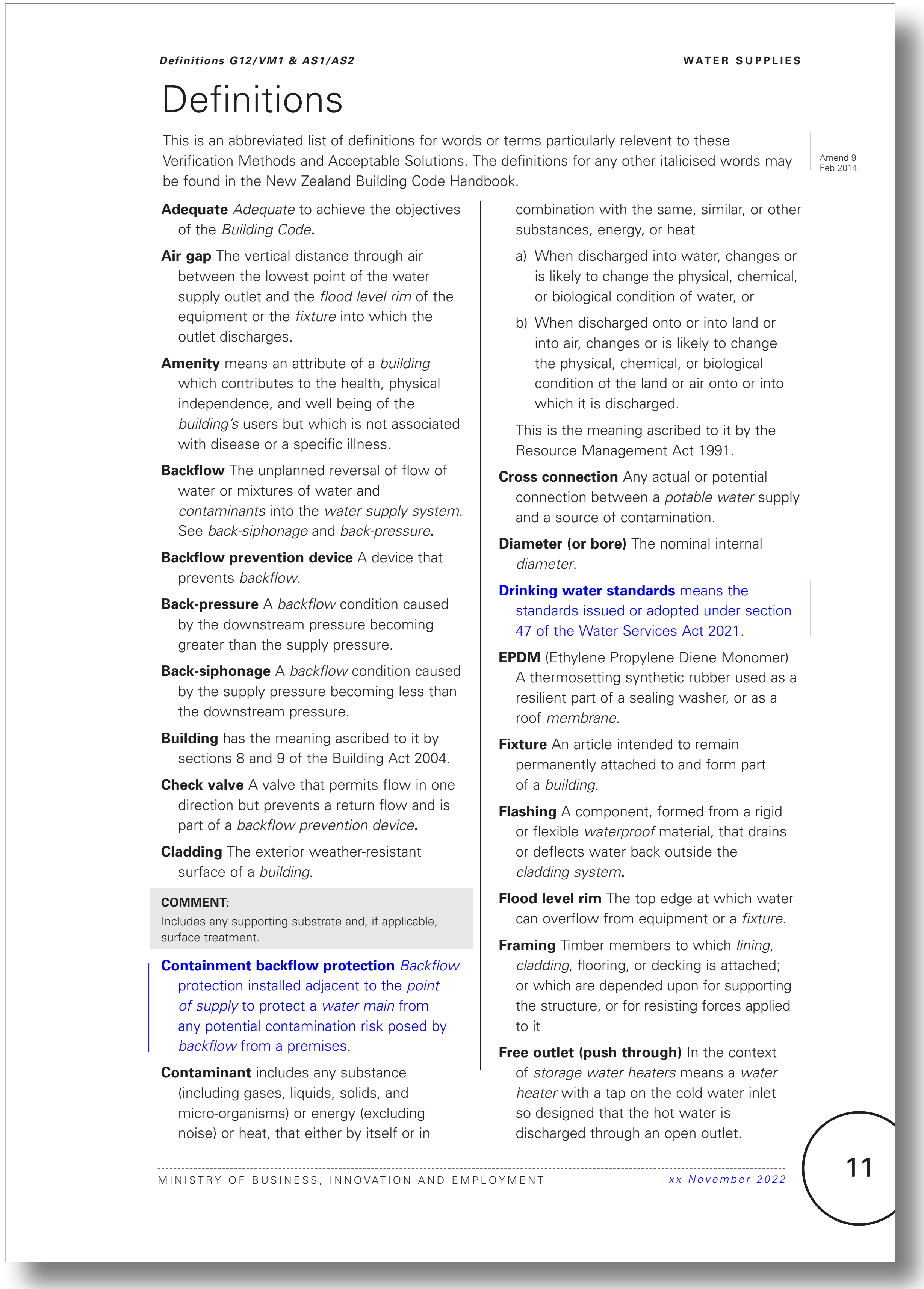
Framing Timber members to which *lining*, *cladding*, flooring, or decking is attached; or which are depended upon for supporting the structure, or for resisting forces applied to it

Free outlet (push through) In the context of *storage water heaters* means a *water heater* with a tap on the cold water inlet so designed that the hot water is discharged through an open outlet.

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT 14 February 2014 11

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods

(Proposed text in blue)



Definitions G12/VM1 & AS1/AS2 WATER SUPPLIES

Definitions

This is an abbreviated list of definitions for words or terms particularly relevent to these Verification Methods and Acceptable Solutions. The definitions for any other italicised words may be found in the New Zealand Building Code Handbook.

Amend 9 Feb 2014

Adequate *Adequate* to achieve the objectives of the *Building Code*.

Air gap The vertical distance through air between the lowest point of the water supply outlet and the *flood level rim* of the equipment or the *fixture* into which the outlet discharges.

Amenity means an attribute of a *building* which contributes to the health, physical independence, and well being of the *building's* users but which is not associated with disease or a specific illness.

Backflow The unplanned reversal of flow of water or mixtures of water and *contaminants* into the *water supply system*. See *back-siphonage* and *back-pressure*.

Backflow prevention device A device that prevents *backflow*.

Back-pressure A *backflow* condition caused by the downstream pressure becoming greater than the supply pressure.

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Building has the meaning ascribed to it by sections 8 and 9 of the Building Act 2004.

Check valve A valve that permits flow in one direction but prevents a return flow and is part of a *backflow prevention device*.

Cladding The exterior weather-resistant surface of a *building*.

COMMENT:
Includes any supporting substrate and, if applicable, surface treatment.

Containment backflow protection *Backflow* protection installed adjacent to the *point of supply* to protect a *water main* from any potential contamination risk posed by *backflow* from a premises.

Contaminant includes any substance (including gases, liquids, solids, and micro-organisms) or energy (excluding noise) or heat, that either by itself or in combination with the same, similar, or other substances, energy, or heat

a) When discharged into water, changes or is likely to change the physical, chemical, or biological condition of water, or

b) When discharged onto or into land or into air, changes or is likely to change the physical, chemical, or biological condition of the land or air onto or into which it is discharged.

This is the meaning ascribed to it by the Resource Management Act 1991.

Cross connection Any actual or potential connection between a *potable water* supply and a source of contamination.

Diameter (or bore) The nominal internal *diameter*.

Drinking water standards means the standards issued or adopted under section 47 of the Water Services Act 2021.

EPDM (Ethylene Propylene Diene Monomer) A thermosetting synthetic rubber used as a resilient part of a sealing washer, or as a roof *membrane*.

Fixture An article intended to remain permanently attached to and form part of a *building*.

Flashing A component, formed from a rigid or flexible *waterproof* material, that drains or deflects water back outside the *cladding system*.

Flood level rim The top edge at which water can overflow from equipment or a *fixture*.

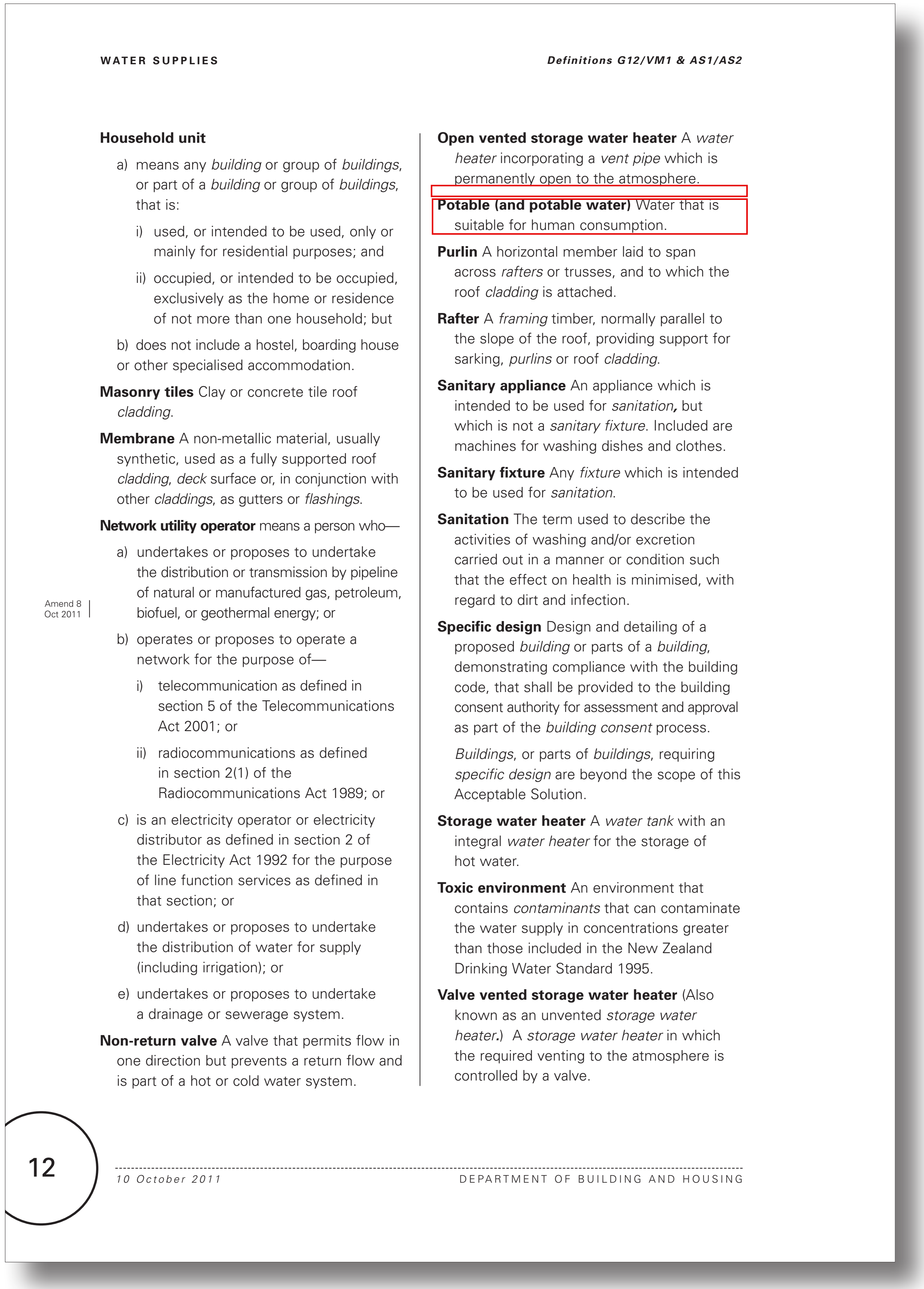
Framing Timber members to which *lining*, *cladding*, flooring, or decking is attached; or which are depended upon for supporting the structure, or for resisting forces applied to it

Free outlet (push through) In the context of *storage water heaters* means a *water heater* with a tap on the cold water inlet so designed that the hot water is discharged through an open outlet.

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT *xx November 2022* 11

Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



WATER SUPPLIES

Definitions G12/VM1 & AS1/AS2

Household unit

a) means any *building* or group of *buildings*, or part of a *building* or group of *buildings*, that is:

i) used, or intended to be used, only or mainly for residential purposes; and

ii) occupied, or intended to be occupied, exclusively as the home or residence of not more than one household; but

b) does not include a hostel, boarding house or other specialised accommodation.

Masonry tiles Clay or concrete tile roof *cladding*.

Membrane A non-metallic material, usually synthetic, used as a fully supported roof *cladding*, *deck* surface or, in conjunction with other *claddings*, as gutters or *flashings*.

Network utility operator means a person who—

a) undertakes or proposes to undertake the distribution or transmission by pipeline of natural or manufactured gas, petroleum, biofuel, or geothermal energy; or

Amend 8
Oct 2011

b) operates or proposes to operate a network for the purpose of—

i) telecommunication as defined in section 5 of the Telecommunications Act 2001; or

ii) radiocommunications as defined in section 2(1) of the Radiocommunications Act 1989; or

c) is an electricity operator or electricity distributor as defined in section 2 of the Electricity Act 1992 for the purpose of line function services as defined in that section; or

d) undertakes or proposes to undertake the distribution of water for supply (including irrigation); or

e) undertakes or proposes to undertake a drainage or sewerage system.

Non-return valve A valve that permits flow in one direction but prevents a return flow and is part of a hot or cold water system.

Open vented storage water heater A *water heater* incorporating a *vent pipe* which is permanently open to the atmosphere.

Potable (and potable water) Water that is suitable for human consumption.

Purlin A horizontal member laid to span across *rafters* or trusses, and to which the roof *cladding* is attached.

Rafter A *framing* timber, normally parallel to the slope of the roof, providing support for sarking, *purlins* or roof *cladding*.

Sanitary appliance An appliance which is intended to be used for *sanitation*, but which is not a *sanitary fixture*. Included are machines for washing dishes and clothes.

Sanitary fixture Any *fixture* which is intended to be used for *sanitation*.

Sanitation The term used to describe the activities of washing and/or excretion carried out in a manner or condition such that the effect on health is minimised, with regard to dirt and infection.

Specific design Design and detailing of a proposed *building* or parts of a *building*, demonstrating compliance with the building code, that shall be provided to the building consent authority for assessment and approval as part of the *building consent* process.

Buildings, or parts of *buildings*, requiring *specific design* are beyond the scope of this Acceptable Solution.

Storage water heater A *water tank* with an integral *water heater* for the storage of hot water.

Toxic environment An environment that contains *contaminants* that can contaminate the water supply in concentrations greater than those included in the New Zealand Drinking Water Standard 1995.

Valve vented storage water heater (Also known as an unvented *storage water heater*.) A *storage water heater* in which the required venting to the atmosphere is controlled by a valve.

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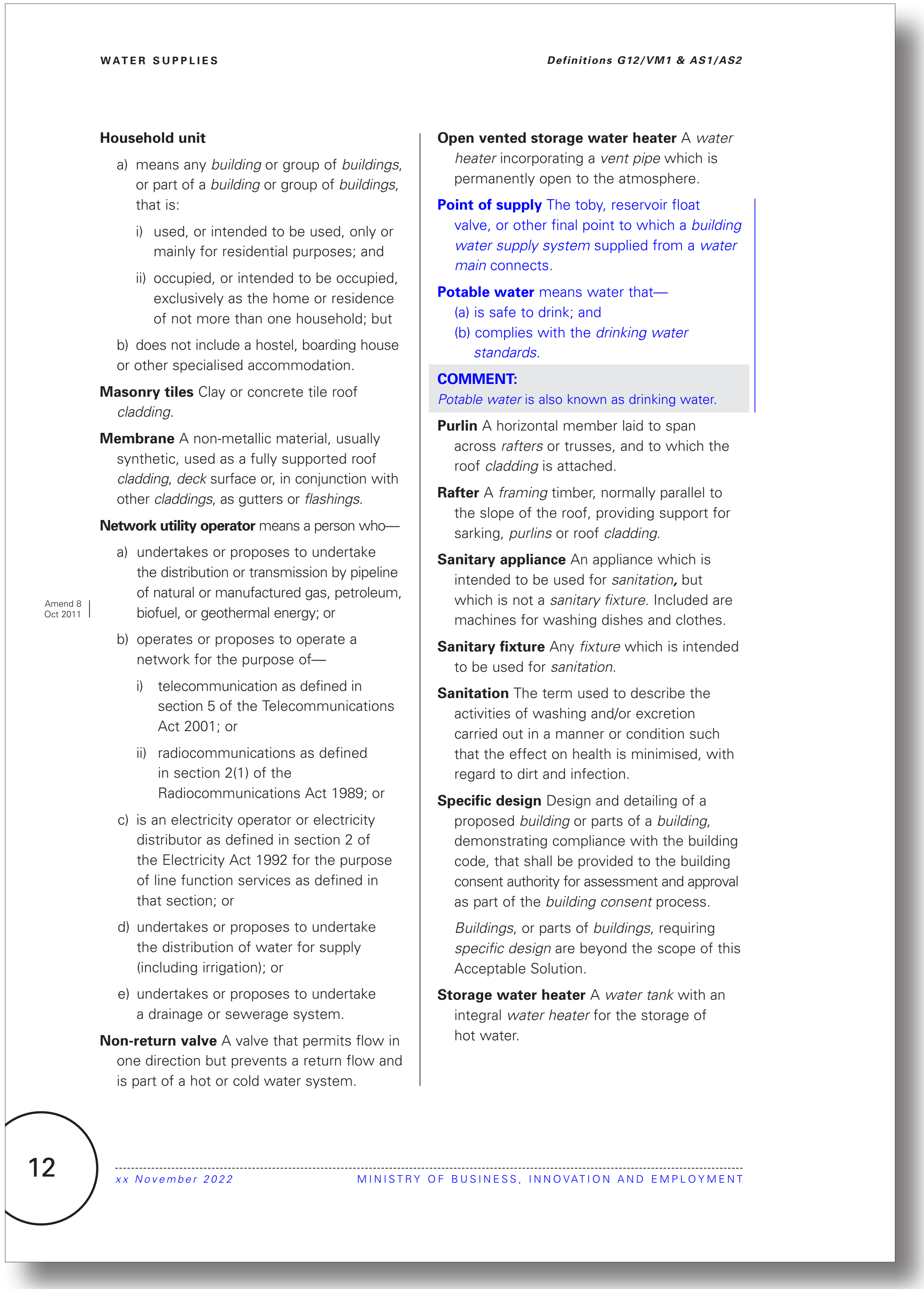
10 October 2011 DEPARTMENT OF BUILDING AND HOUSING

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



WATER SUPPLIES

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a) undertakes or proposes to undertake the distribution or transmission by pipeline of natural or manufactured gas, petroleum, biofuel, or geothermal energy; or

Amend 8
Oct 2011

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e) undertakes or proposes to undertake a drainage or sewerage system.

Non-return valve A valve that permits flow in one direction but prevents a return flow and is part of a hot or cold water system.

Open vented storage water heater A *water heater* incorporating a *vent pipe* which is permanently open to the atmosphere.

Point of supply The toby, reservoir float valve, or other final point to which a *building water supply system* supplied from a *water main* connects.

Potable water means water that—

(a) is safe to drink; and

(b) complies with the *drinking water standards*.

COMMENT:
Potable water is also known as drinking water.

Purlin A horizontal member laid to span across *rafters* or trusses, and to which the roof *cladding* is attached.

Rafter A *framing* timber, normally parallel to the slope of the roof, providing support for sarking, *purlins* or roof *cladding*.

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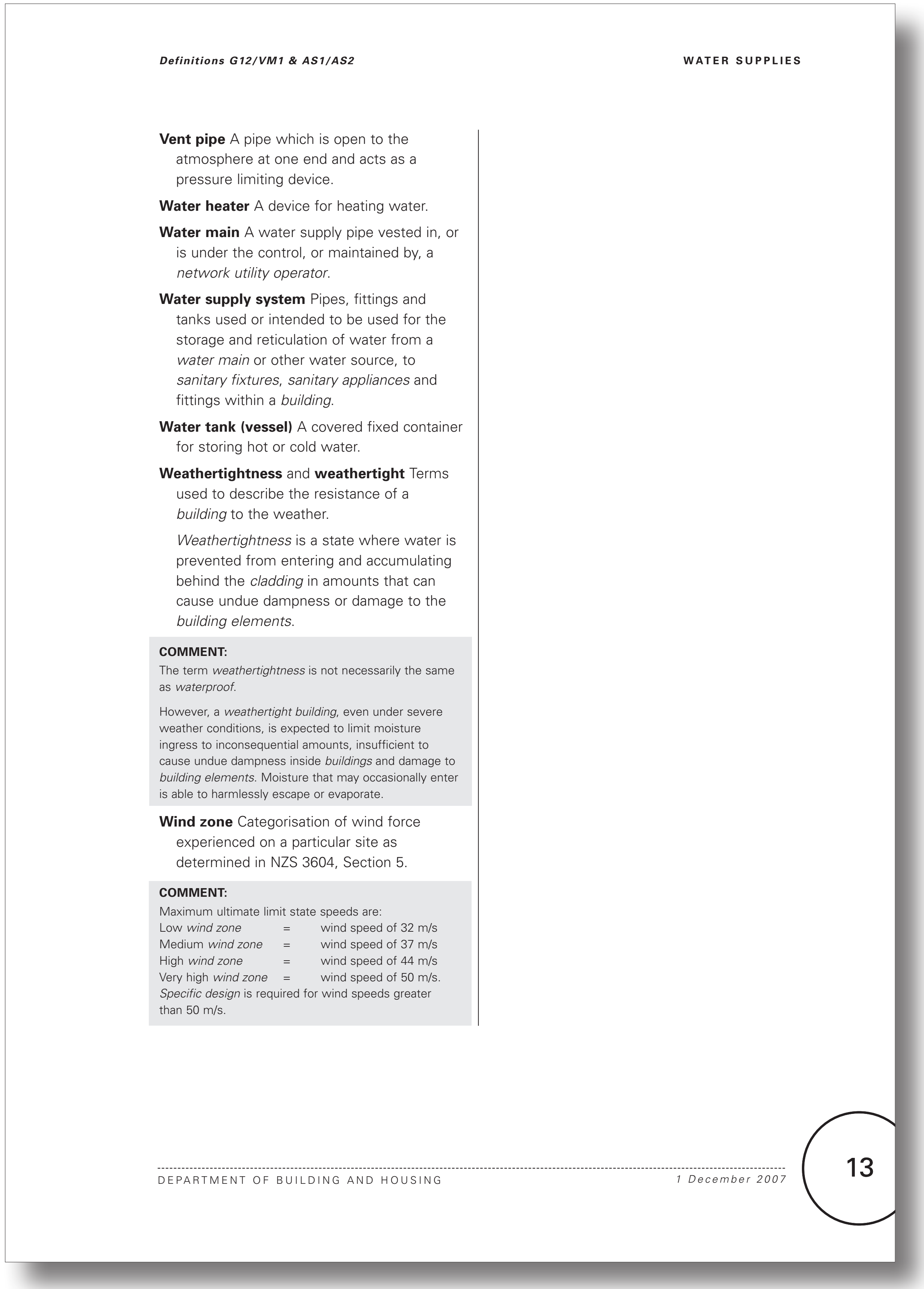
xx November 2022 MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Current G12 Water Supplies - No changes proposed to this page



Definitions G12/VM1 & AS1/AS2

WATER SUPPLIES

Vent pipe A pipe which is open to the atmosphere at one end and acts as a pressure limiting device.

Water heater A device for heating water.

Water main A water supply pipe vested in, or is under the control, or maintained by, a *network utility operator.*

Water supply system Pipes, fittings and tanks used or intended to be used for the storage and reticulation of water from a *water main* or other water source, to *sanitary fixtures, sanitary appliances* and fittings within a *building.*

Water tank (vessel) A covered fixed container for storing hot or cold water.

Weathertightness and **weathertight** Terms used to describe the resistance of a *building* to the weather.

Weathertightness is a state where water is prevented from entering and accumulating behind the *cladding* in amounts that can cause undue dampness or damage to the *building elements.*

COMMENT:

The term *weathertightness* is not necessarily the same as *waterproof.*

However, a *weathertight building,* even under severe weather conditions, is expected to limit moisture ingress to inconsequential amounts, insufficient to cause undue dampness inside *buildings* and damage to *building elements.* Moisture that may occasionally enter is able to harmlessly escape or evaporate.

Wind zone Categorisation of wind force experienced on a particular site as determined in NZS 3604, Section 5.

COMMENT:

Maximum ultimate limit state speeds are:
Low *wind zone* = wind speed of 32 m/s
Medium *wind zone* = wind speed of 37 m/s
High *wind zone* = wind speed of 44 m/s
Very high *wind zone* = wind speed of 50 m/s.
Specific design is required for wind speeds greater than 50 m/s.

DEPARTMENT OF BUILDING AND HOUSING

1 December 2007

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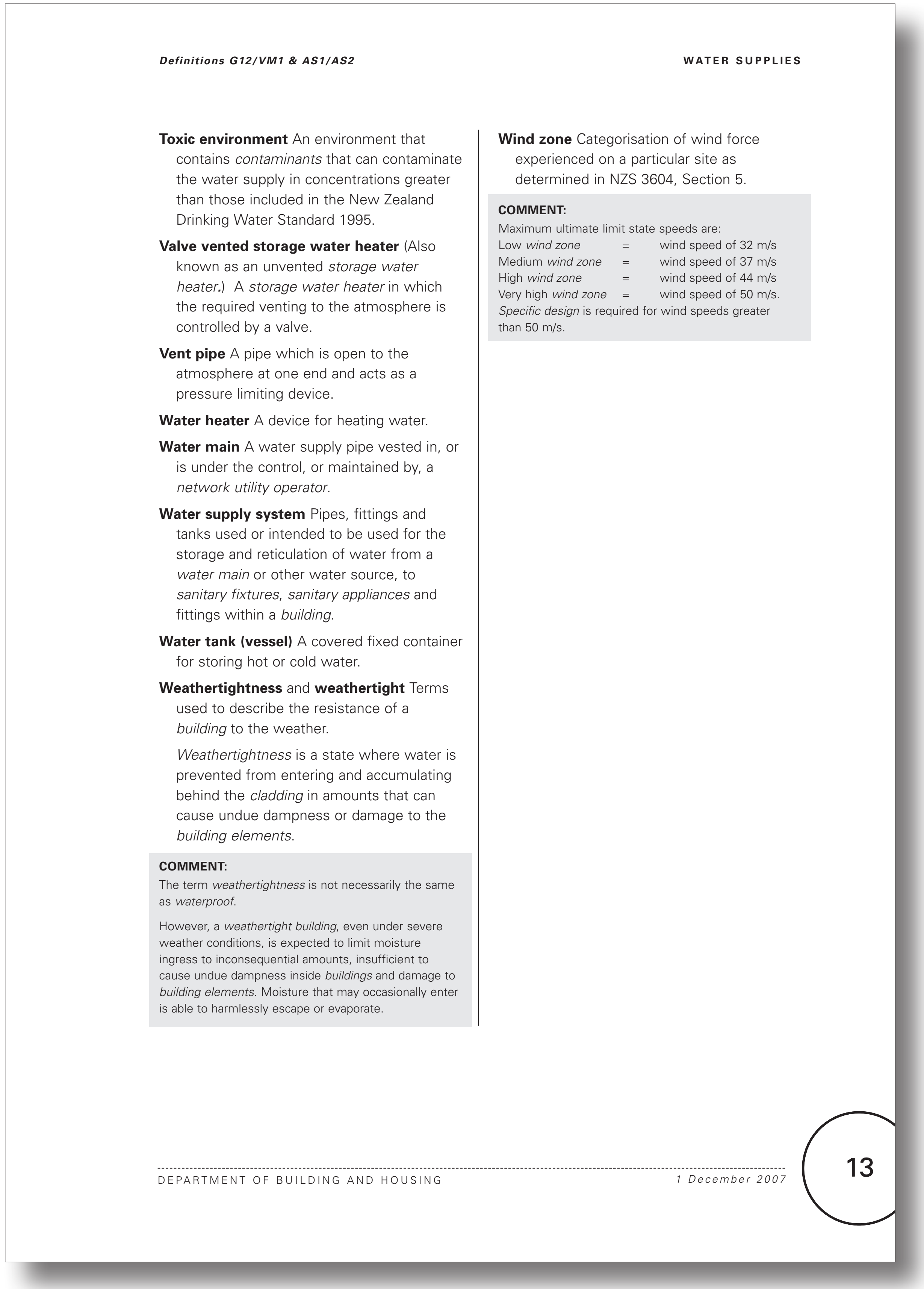
Proposed G12 Water Supplies - No changes proposed to this page



Definitions G12/VM1 & AS1/AS2

WATER SUPPLIES

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DEPARTMENT OF BUILDING AND HOUSING

1 December 2007

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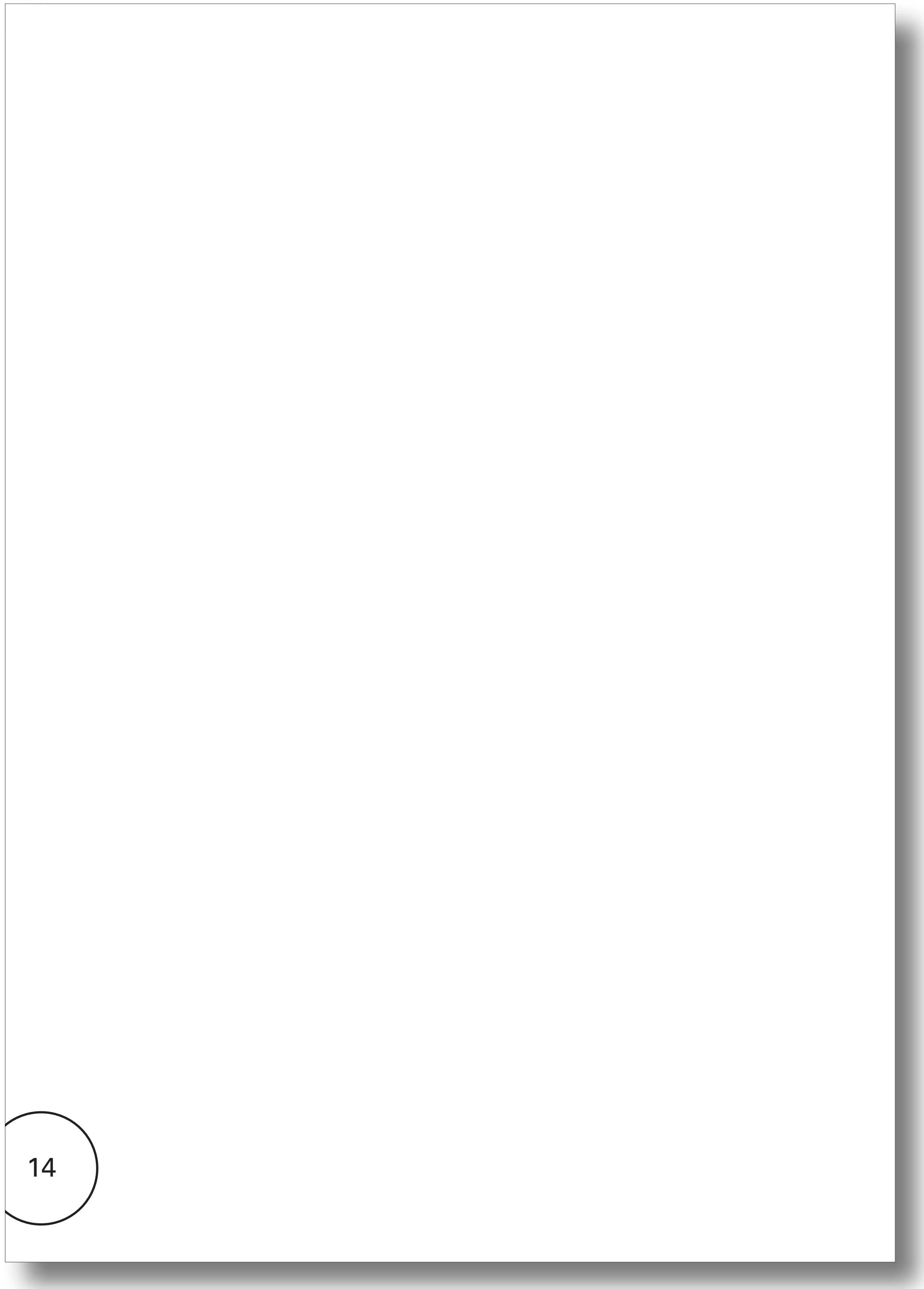

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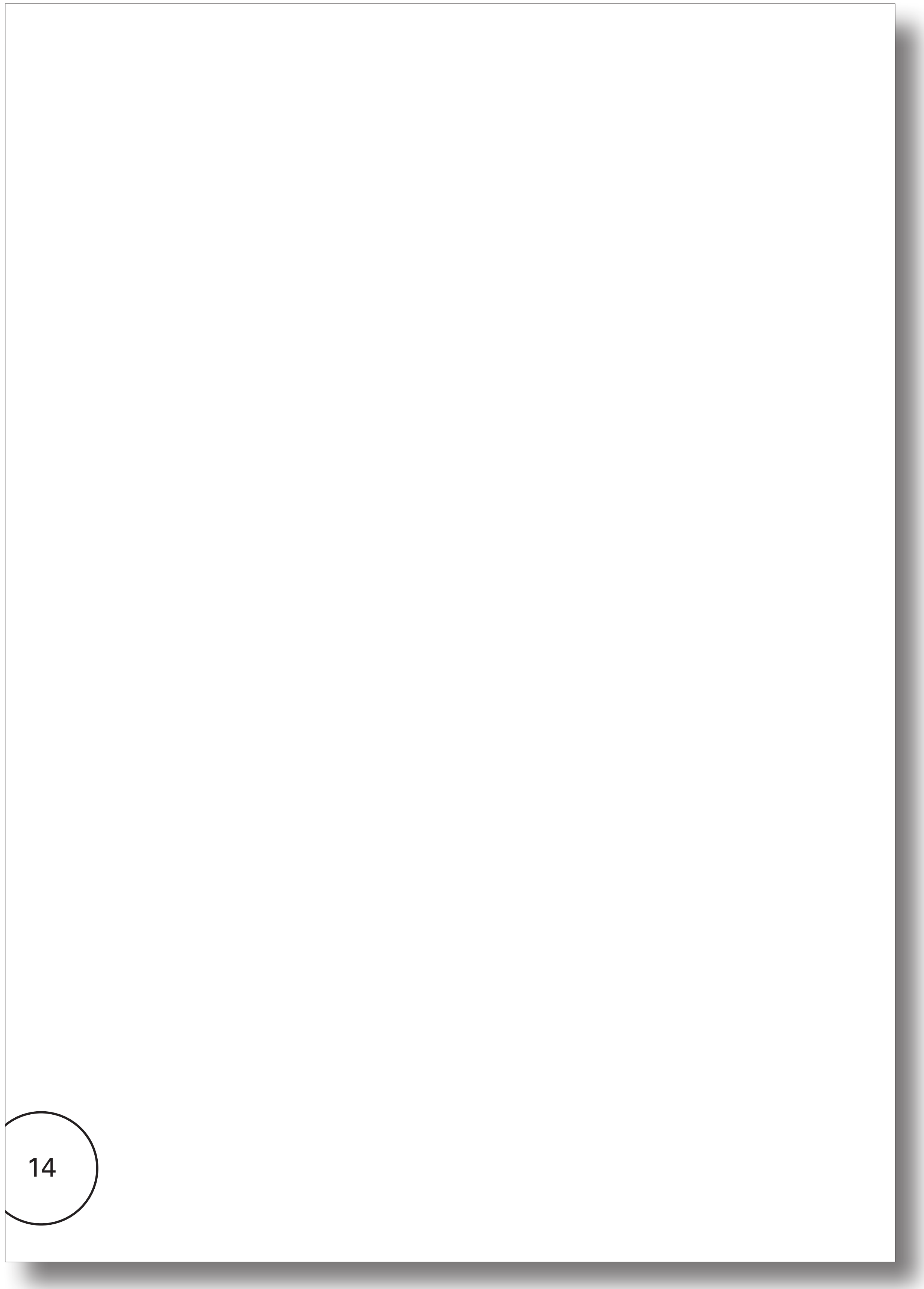

Current G12 Water Supplies acceptable solutions and verification methods

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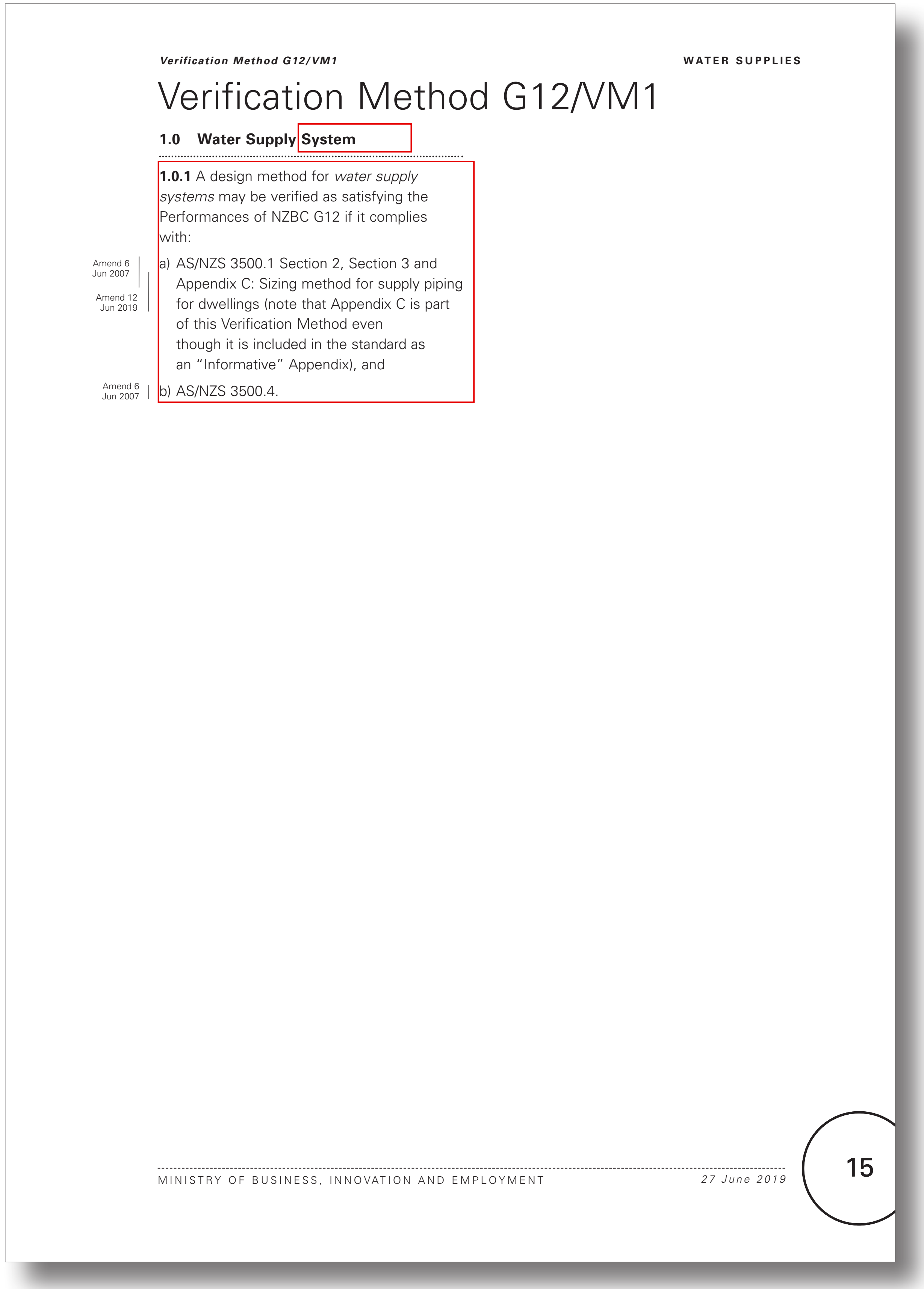

Verification Method G12/VM1 WATER SUPPLIES

Verification Method G12/VM1

1.0 Water Supply System

1.0.1 A design method for *water supply systems* may be verified as satisfying the Performances of NZBC G12 if it complies with:

Amend 6 Jun 2007 Amend 12 Jun 2019 a) AS/NZS 3500.1 Section 2, Section 3 and Appendix C: Sizing method for supply piping for dwellings (note that Appendix C is part of this Verification Method even though it is included in the standard as an "Informative" Appendix), and

Amend 6 Jun 2007 b) AS/NZS 3500.4.

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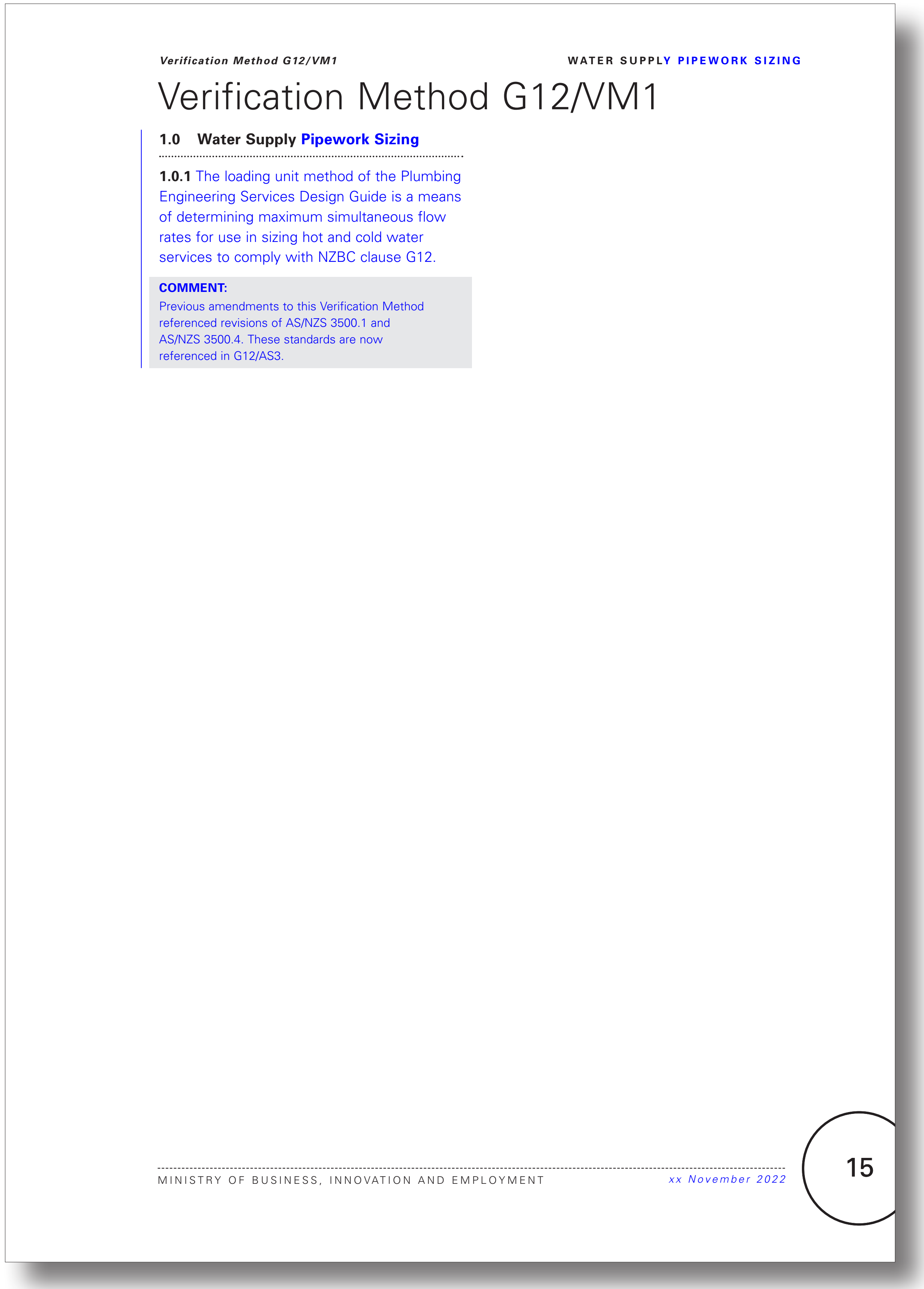
Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



Verification Method G12/VM1 WATER SUPPLY PIPEWORK SIZING

Verification Method G12/VM1

1.0 Water Supply Pipework Sizing

1.0.1 The loading unit method of the Plumbing Engineering Services Design Guide is a means of determining maximum simultaneous flow rates for use in sizing hot and cold water services to comply with NZBC clause G12.

COMMENT:
Previous amendments to this Verification Method referenced revisions of AS/NZS 3500.1 and AS/NZS 3500.4. These standards are now referenced in G12/AS3.

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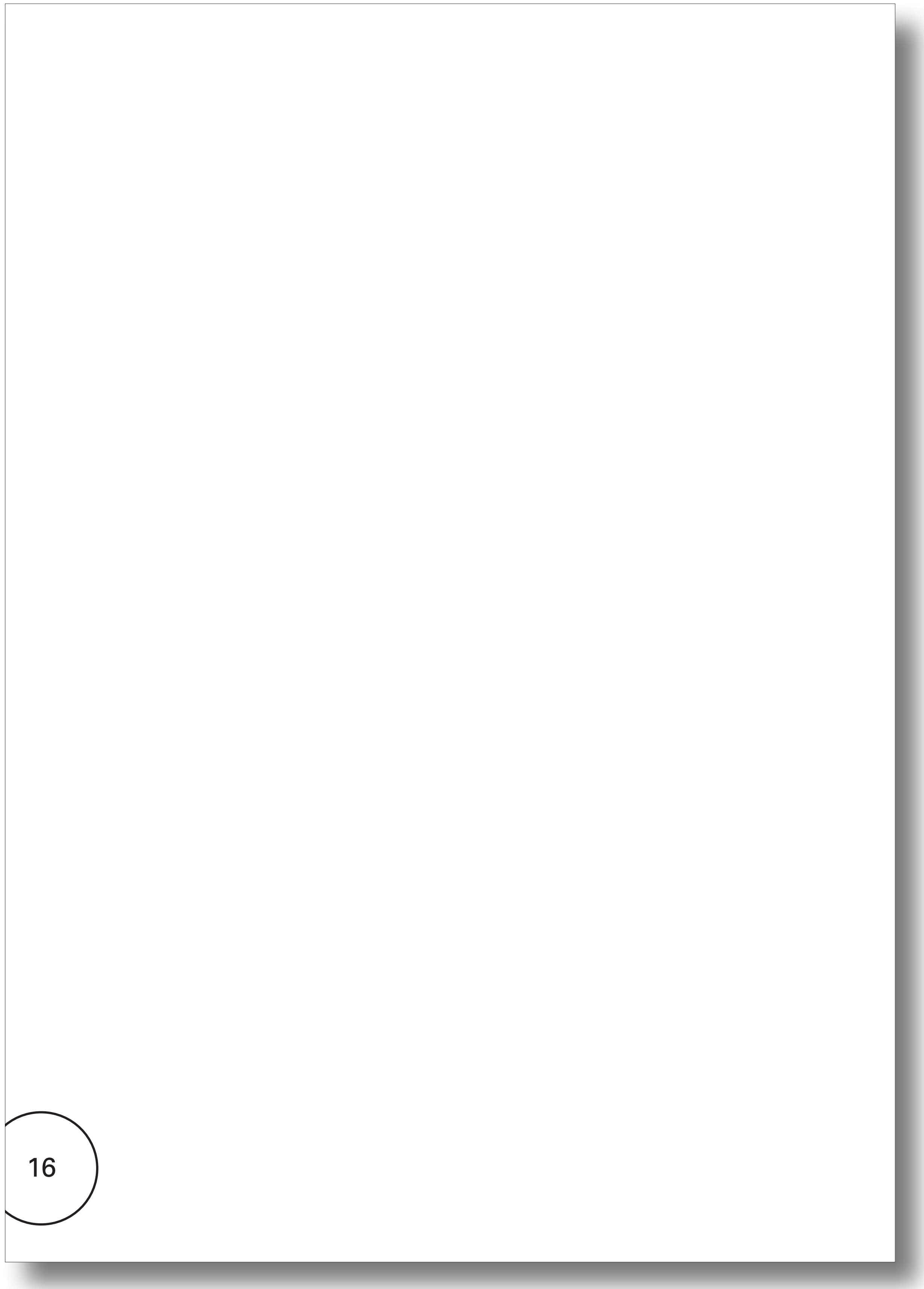
Current G12 Water Supplies - No changes proposed to this page



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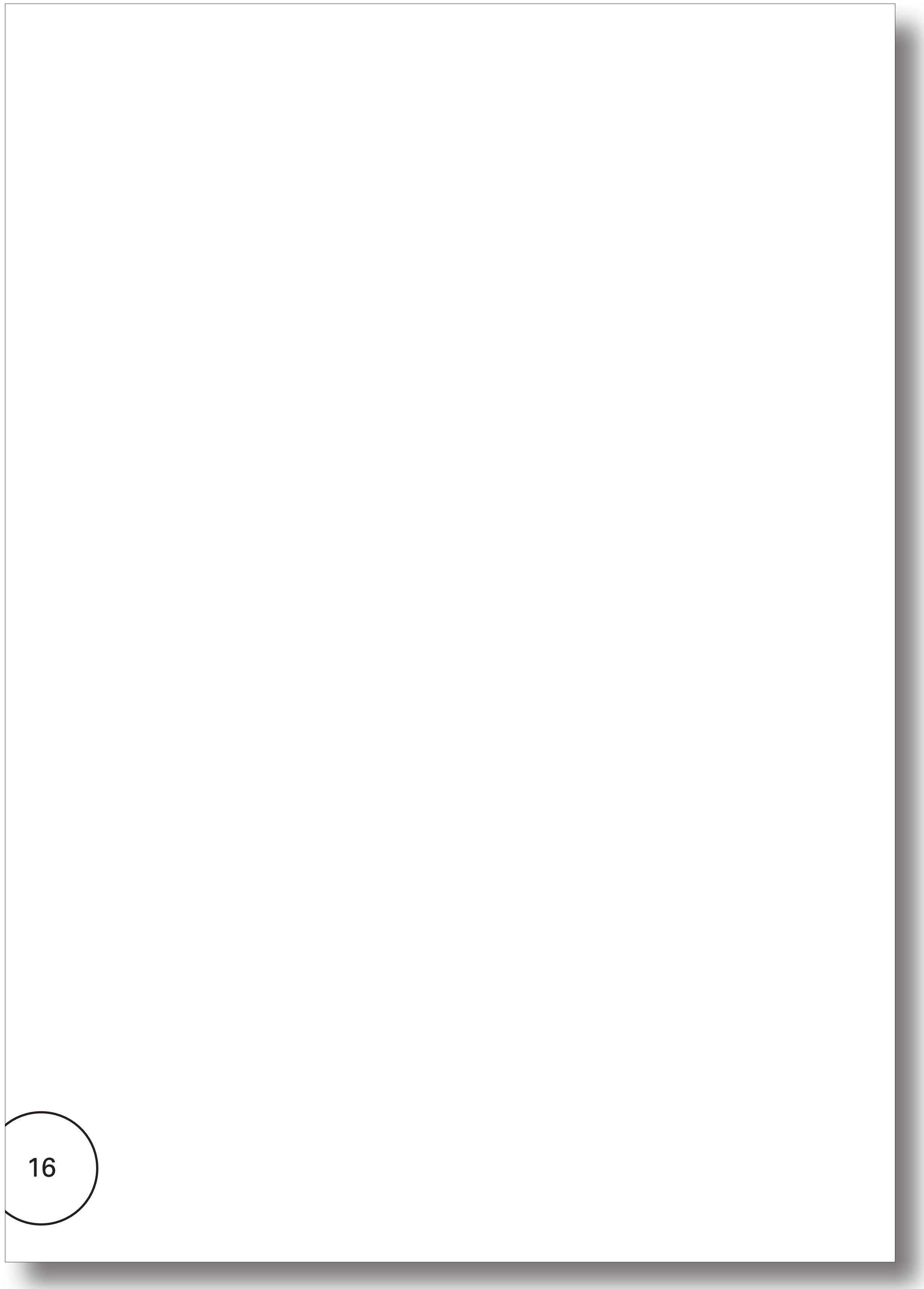
Proposed G12 Water Supplies - No changes proposed to this page



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Current G12 Water Supplies acceptable solutions and verification methods

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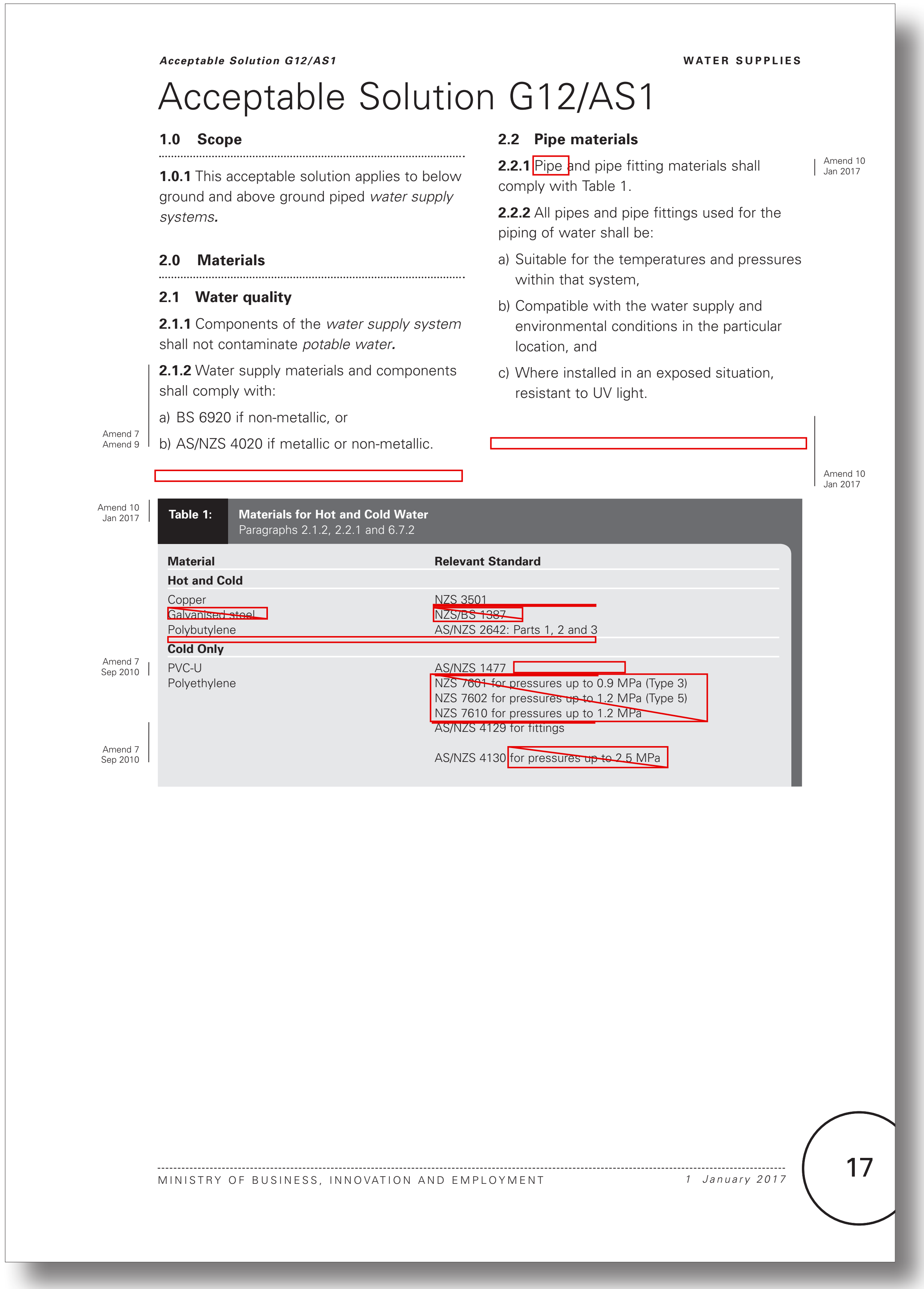

Acceptable Solution G12/AS1 WATER SUPPLIES

Acceptable Solution G12/AS1

1.0 Scope

1.0.1 This acceptable solution applies to below ground and above ground piped *water supply systems.*

2.0 Materials

2.1 Water quality

2.1.1 Components of the *water supply system* shall not contaminate *potable water.*

2.1.2 Water supply materials and components shall comply with:

a) BS 6920 if non-metallic, or

Amend 7 Amend 9 b) AS/NZS 4020 if metallic or non-metallic.

2.2 Pipe materials

2.2.1 Pipe and pipe fitting materials shall comply with Table 1. Amend 10 Jan 2017

2.2.2 All pipes and pipe fittings used for the piping of water shall be:

a) Suitable for the temperatures and pressures within that system,

b) Compatible with the water supply and environmental conditions in the particular location, and

c) Where installed in an exposed situation, resistant to UV light.

Amend 10 Jan 2017

Amend 10 Jan 2017

Table 1: Materials for Hot and Cold Water
Paragraphs 2.1.2, 2.2.1 and 6.7.2

Material	Relevant Standard
Hot and Cold	
Copper	NZS 3501
~~Galvanised steel~~	~~NZS/BS 1387~~
Polybutylene	AS/NZS 2642: Parts 1, 2 and 3
Cold Only	
PVC-U	AS/NZS 1477
Polyethylene	~~NZS 7601 for pressures up to 0.9 MPa (Type 3)~~ ~~NZS 7602 for pressures up to 1.2 MPa (Type 5)~~ ~~NZS 7610 for pressures up to 1.2 MPa~~ AS/NZS 4129 for fittings AS/NZS 4130 ~~for pressures up to 2.5 MPa~~

Amend 7 Sep 2010

Amend 7 Sep 2010

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT 1 January 2017

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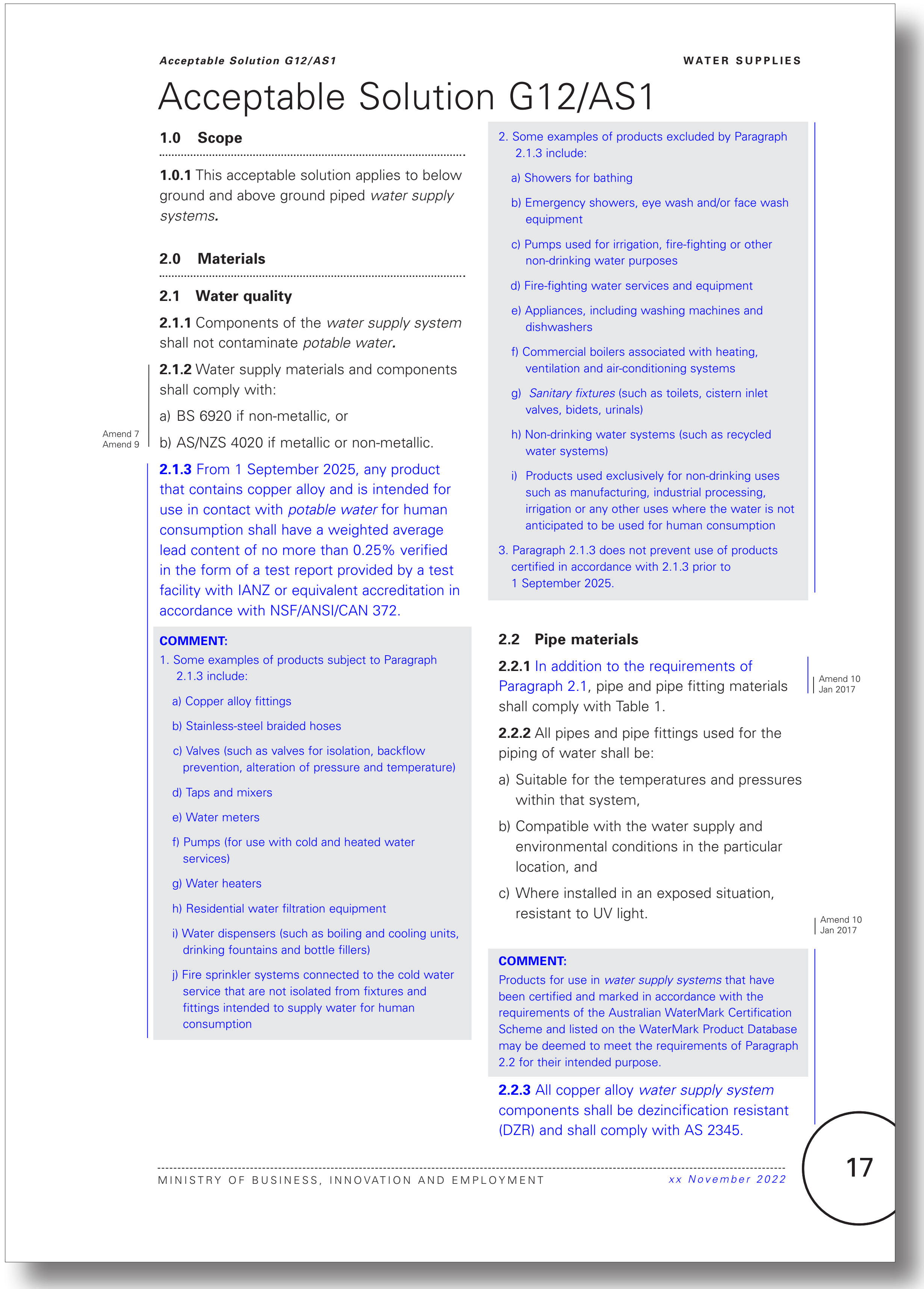
Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



Acceptable Solution G12/AS1 WATER SUPPLIES

Acceptable Solution G12/AS1

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2.1 Water quality

2.1.1 Components of the *water supply system* shall not contaminate *potable water.*

2.1.2 Water supply materials and components shall comply with:

a) BS 6920 if non-metallic, or

Amend 7 Amend 9 b) AS/NZS 4020 if metallic or non-metallic.

2.1.3 From 1 September 2025, any product that contains copper alloy and is intended for use in contact with *potable water* for human consumption shall have a weighted average lead content of no more than 0.25% verified in the form of a test report provided by a test facility with IANZ or equivalent accreditation in accordance with NSF/ANSI/CAN 372.

COMMENT:

1. Some examples of products subject to Paragraph 2.1.3 include:
   - a) Copper alloy fittings
   - b) Stainless-steel braided hoses
   - c) Valves (such as valves for isolation, backflow prevention, alteration of pressure and temperature)
   - d) Taps and mixers
   - e) Water meters
   - f) Pumps (for use with cold and heated water services)
   - g) Water heaters
   - h) Residential water filtration equipment
   - i) Water dispensers (such as boiling and cooling units, drinking fountains and bottle fillers)
   - j) Fire sprinkler systems connected to the cold water service that are not isolated from fixtures and fittings intended to supply water for human consumption
2. Some examples of products excluded by Paragraph 2.1.3 include:
   - a) Showers for bathing
   - b) Emergency showers, eye wash and/or face wash equipment
   - c) Pumps used for irrigation, fire-fighting or other non-drinking water purposes
   - d) Fire-fighting water services and equipment
   - e) Appliances, including washing machines and dishwashers
   - f) Commercial boilers associated with heating, ventilation and air-conditioning systems
   - g) *Sanitary fixtures* (such as toilets, cistern inlet valves, bidets, urinals)
   - h) Non-drinking water systems (such as recycled water systems)
   - i) Products used exclusively for non-drinking uses such as manufacturing, industrial processing, irrigation or any other uses where the water is not anticipated to be used for human consumption
3. Paragraph 2.1.3 does not prevent use of products certified in accordance with 2.1.3 prior to 1 September 2025.

2.2 Pipe materials

2.2.1 In addition to the requirements of Paragraph 2.1, pipe and pipe fitting materials shall comply with Table 1. Amend 10 Jan 2017

2.2.2 All pipes and pipe fittings used for the piping of water shall be:

a) Suitable for the temperatures and pressures within that system,

b) Compatible with the water supply and environmental conditions in the particular location, and

c) Where installed in an exposed situation, resistant to UV light.

Amend 10 Jan 2017

COMMENT:

Products for use in *water supply systems* that have been certified and marked in accordance with the requirements of the Australian WaterMark Certification Scheme and listed on the WaterMark Product Database may be deemed to meet the requirements of Paragraph 2.2 for their intended purpose.

2.2.3 All copper alloy *water supply system* components shall be dezincification resistant (DZR) and shall comply with AS 2345.

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT xx November 2022

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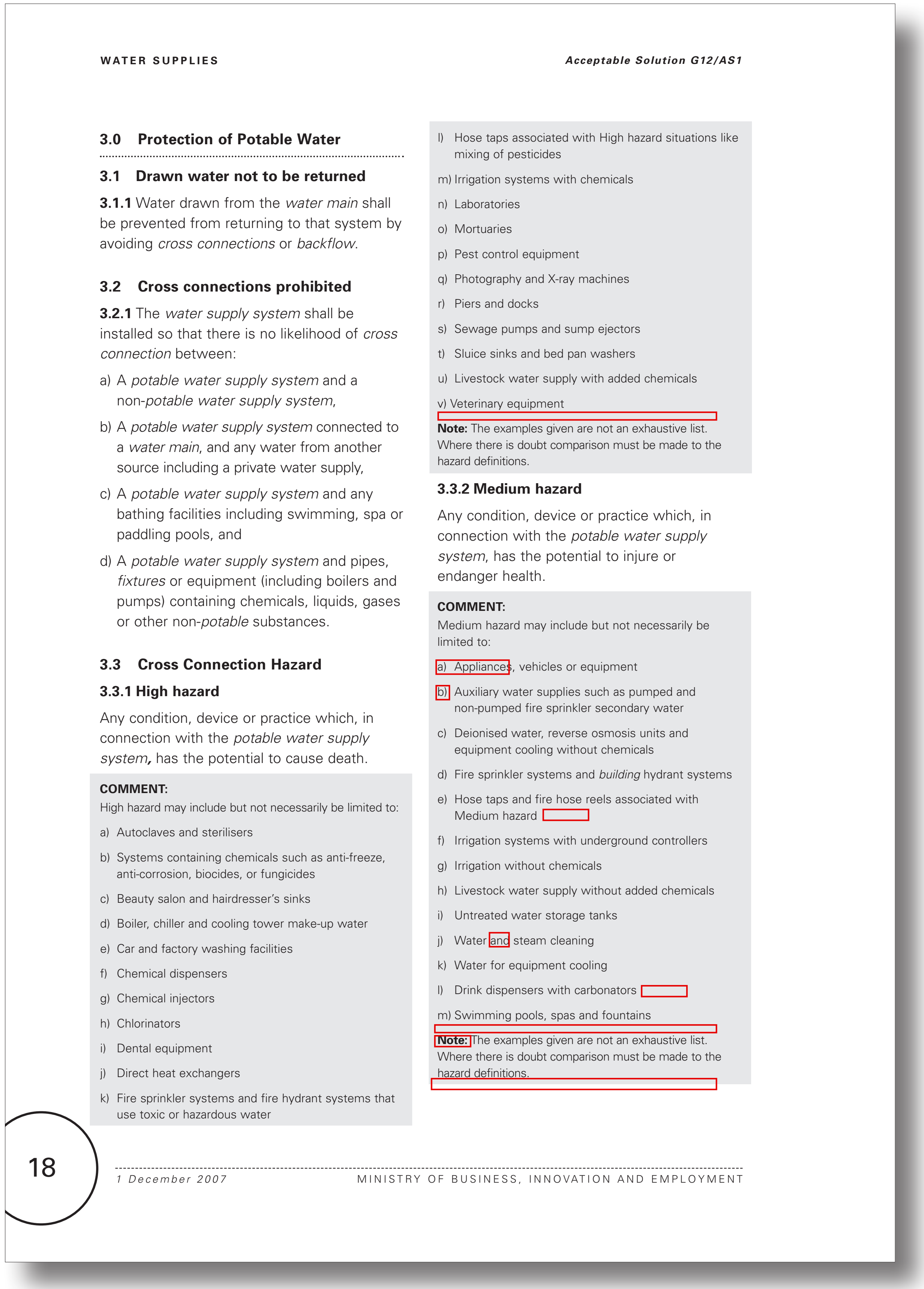
Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



WATER SUPPLIES

Acceptable Solution G12/AS1

3.0 Protection of Potable Water

3.1 Drawn water not to be returned

3.1.1 Water drawn from the *water main* shall be prevented from returning to that system by avoiding *cross connections* or *backflow*.

3.2 Cross connections prohibited

3.2.1 The *water supply system* shall be installed so that there is no likelihood of *cross connection* between:

a) A *potable water supply system* and a non-*potable water supply system*,

b) A *potable water supply system* connected to a *water main*, and any water from another source including a private water supply,

c) A *potable water supply system* and any bathing facilities including swimming, spa or paddling pools, and

d) A *potable water supply system* and pipes, *fixtures* or equipment (including boilers and pumps) containing chemicals, liquids, gases or other non-*potable* substances.

3.3 Cross Connection Hazard

3.3.1 High hazard

Any condition, device or practice which, in connection with the *potable water supply system*, has the potential to cause death.

COMMENT:

High hazard may include but not necessarily be limited to:

a) Autoclaves and sterilisers

b) Systems containing chemicals such as anti-freeze, anti-corrosion, biocides, or fungicides

c) Beauty salon and hairdresser's sinks

d) Boiler, chiller and cooling tower make-up water

e) Car and factory washing facilities

f) Chemical dispensers

g) Chemical injectors

h) Chlorinators

i) Dental equipment

j) Direct heat exchangers

k) Fire sprinkler systems and fire hydrant systems that use toxic or hazardous water

l) Hose taps associated with High hazard situations like mixing of pesticides

m) Irrigation systems with chemicals

n) Laboratories

o) Mortuaries

p) Pest control equipment

q) Photography and X-ray machines

r) Piers and docks

s) Sewage pumps and sump ejectors

t) Sluice sinks and bed pan washers

u) Livestock water supply with added chemicals

v) Veterinary equipment

Note: The examples given are not an exhaustive list. Where there is doubt comparison must be made to the hazard definitions.

3.3.2 Medium hazard

Any condition, device or practice which, in connection with the *potable water supply system*, has the potential to injure or endanger health.

COMMENT:

Medium hazard may include but not necessarily be limited to:

a) Appliances, vehicles or equipment

b) Auxiliary water supplies such as pumped and non-pumped fire sprinkler secondary water

c) Deionised water, reverse osmosis units and equipment cooling without chemicals

d) Fire sprinkler systems and *building* hydrant systems

e) Hose taps and fire hose reels associated with Medium hazard

f) Irrigation systems with underground controllers

g) Irrigation without chemicals

h) Livestock water supply without added chemicals

i) Untreated water storage tanks

j) Water and steam cleaning

k) Water for equipment cooling

l) Drink dispensers with carbonators

m) Swimming pools, spas and fountains

Note: The examples given are not an exhaustive list. Where there is doubt comparison must be made to the hazard definitions.

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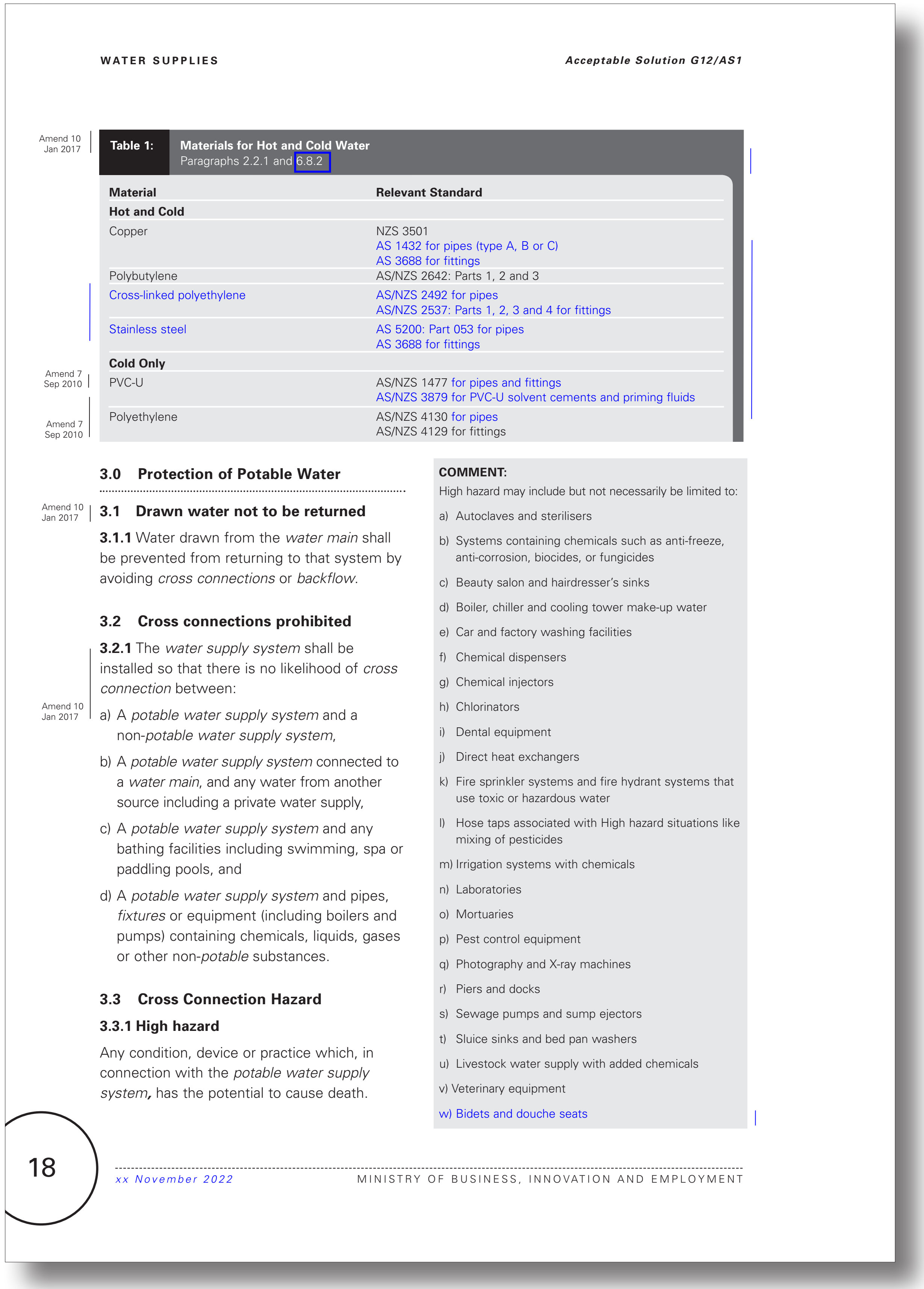
Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



WATER SUPPLIES

Acceptable Solution G12/AS1

Amend 10
Jan 2017

Table 1: Materials for Hot and Cold Water
Paragraphs 2.2.1 and 6.8.2

Material	Relevant Standard
Hot and Cold	
Copper	NZS 3501 AS 1432 for pipes (type A, B or C) AS 3688 for fittings
Polybutylene	AS/NZS 2642: Parts 1, 2 and 3
Cross-linked polyethylene	AS/NZS 2492 for pipes AS/NZS 2537: Parts 1, 2, 3 and 4 for fittings
Stainless steel	AS 5200: Part 053 for pipes AS 3688 for fittings
Cold Only	
PVC-U	AS/NZS 1477 for pipes and fittings AS/NZS 3879 for PVC-U solvent cements and priming fluids
Polyethylene	AS/NZS 4130 for pipes AS/NZS 4129 for fittings

Amend 7
Sep 2010

Amend 7
Sep 2010

3.0 Protection of Potable Water

Amend 10
Jan 2017

3.1 Drawn water not to be returned

3.1.1 Water drawn from the *water main* shall be prevented from returning to that system by avoiding *cross connections* or *backflow*.

3.2 Cross connections prohibited

3.2.1 The *water supply system* shall be installed so that there is no likelihood of *cross connection* between:

Amend 10
Jan 2017

a) A *potable water supply system* and a non-*potable water supply system*,

b) A *potable water supply system* connected to a *water main*, and any water from another source including a private water supply,

c) A *potable water supply system* and any bathing facilities including swimming, spa or paddling pools, and

d) A *potable water supply system* and pipes, *fixtures* or equipment (including boilers and pumps) containing chemicals, liquids, gases or other non-*potable* substances.

3.3 Cross Connection Hazard

3.3.1 High hazard

Any condition, device or practice which, in connection with the *potable water supply system*, has the potential to cause death.

COMMENT:

High hazard may include but not necessarily be limited to:

a) Autoclaves and sterilisers

b) Systems containing chemicals such as anti-freeze, anti-corrosion, biocides, or fungicides

c) Beauty salon and hairdresser's sinks

d) Boiler, chiller and cooling tower make-up water

e) Car and factory washing facilities

f) Chemical dispensers

g) Chemical injectors

h) Chlorinators

i) Dental equipment

j) Direct heat exchangers

k) Fire sprinkler systems and fire hydrant systems that use toxic or hazardous water

l) Hose taps associated with High hazard situations like mixing of pesticides

m) Irrigation systems with chemicals

n) Laboratories

o) Mortuaries

p) Pest control equipment

q) Photography and X-ray machines

r) Piers and docks

s) Sewage pumps and sump ejectors

t) Sluice sinks and bed pan washers

u) Livestock water supply with added chemicals

v) Veterinary equipment

w) Bidets and douche seats

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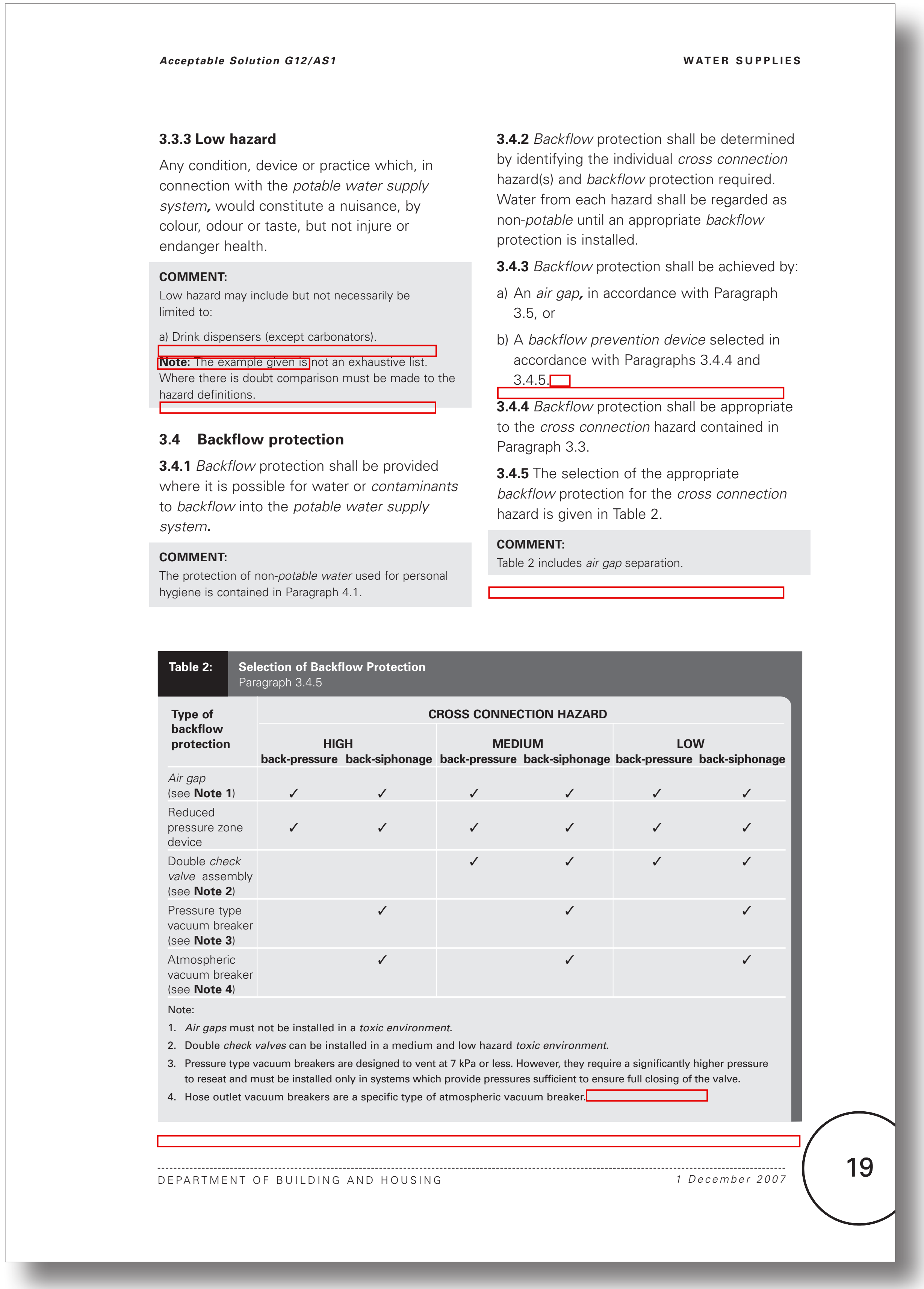
Current G12 Water Supplies acceptable solutions and verification methods
(Text to be amended shown in red)



Acceptable Solution G12/AS1 WATER SUPPLIES

3.3.3 Low hazard

Any condition, device or practice which, in connection with the *potable water supply system,* would constitute a nuisance, by colour, odour or taste, but not injure or endanger health.

COMMENT:
Low hazard may include but not necessarily be limited to:

a) Drink dispensers (except carbonators).

Note: The example given is not an exhaustive list. Where there is doubt comparison must be made to the hazard definitions.

3.4 Backflow protection

3.4.1 *Backflow* protection shall be provided where it is possible for water or *contaminants* to *backflow* into the *potable water supply system.*

COMMENT:
The protection of non-*potable water* used for personal hygiene is contained in Paragraph 4.1.

3.4.2 *Backflow* protection shall be determined by identifying the individual *cross connection* hazard(s) and *backflow* protection required. Water from each hazard shall be regarded as non-*potable* until an appropriate *backflow* protection is installed.

3.4.3 *Backflow* protection shall be achieved by:

a) An *air gap,* in accordance with Paragraph 3.5, or

b) A *backflow prevention device* selected in accordance with Paragraphs 3.4.4 and 3.4.5.

3.4.4 *Backflow* protection shall be appropriate to the *cross connection* hazard contained in Paragraph 3.3.

3.4.5 The selection of the appropriate *backflow* protection for the *cross connection* hazard is given in Table 2.

COMMENT:
Table 2 includes *air gap* separation.

Table 2: **Selection of Backflow Protection**
Paragraph 3.4.5

Type of backflow protection	CROSS CONNECTION HAZARD					
	HIGH		MEDIUM		LOW	
	back-pressure	back-siphonage	back-pressure	back-siphonage	back-pressure	back-siphonage
Air gap (see **Note 1**)	✓	✓	✓	✓	✓	✓
Reduced pressure zone device	✓	✓	✓	✓	✓	✓
Double *check valve* assembly (see **Note 2**)			✓	✓	✓	✓
Pressure type vacuum breaker (see **Note 3**)		✓		✓		✓
Atmospheric vacuum breaker (see **Note 4**)		✓		✓		✓

Note:
1. *Air gaps* must not be installed in a *toxic environment.*
2. Double *check valves* can be installed in a medium and low hazard *toxic environment.*
3. Pressure type vacuum breakers are designed to vent at 7 kPa or less. However, they require a significantly higher pressure to reseat and must be installed only in systems which provide pressures sufficient to ensure full closing of the valve.
4. Hose outlet vacuum breakers are a specific type of atmospheric vacuum breaker.

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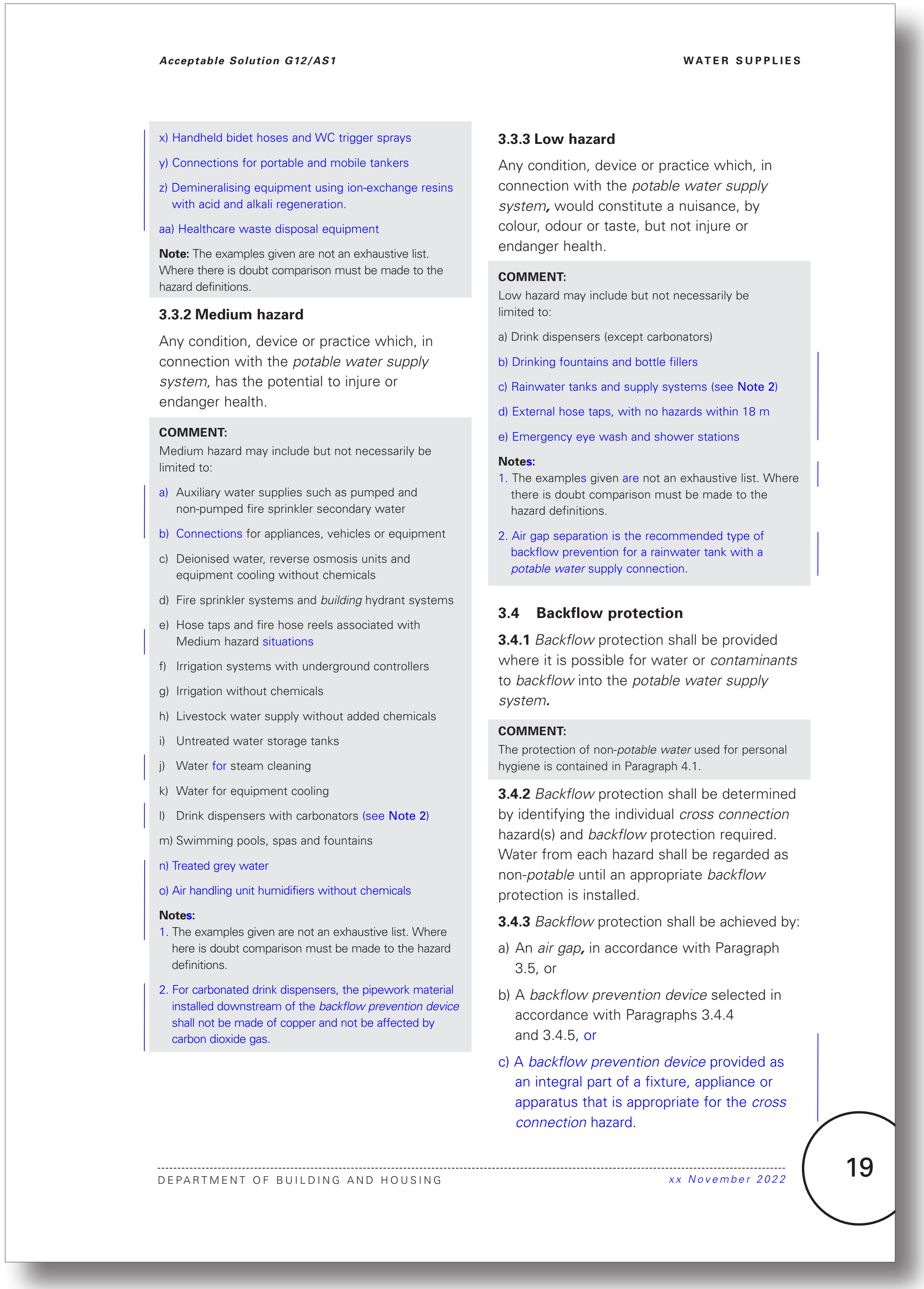
Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



Acceptable Solution G12/AS1 WATER SUPPLIES

x) Handheld bidet hoses and WC trigger sprays

y) Connections for portable and mobile tankers

z) Demineralising equipment using ion-exchange resins with acid and alkali regeneration.

aa) Healthcare waste disposal equipment

Note: The examples given are not an exhaustive list. Where there is doubt comparison must be made to the hazard definitions.

3.3.2 Medium hazard

Any condition, device or practice which, in connection with the *potable water supply system*, has the potential to injure or endanger health.

COMMENT:
Medium hazard may include but not necessarily be limited to:

a) Auxiliary water supplies such as pumped and non-pumped fire sprinkler secondary water

b) Connections for appliances, vehicles or equipment

c) Deionised water, reverse osmosis units and equipment cooling without chemicals

d) Fire sprinkler systems and *building* hydrant systems

e) Hose taps and fire hose reels associated with Medium hazard situations

f) Irrigation systems with underground controllers

g) Irrigation without chemicals

h) Livestock water supply without added chemicals

i) Untreated water storage tanks

j) Water for steam cleaning

k) Water for equipment cooling

l) Drink dispensers with carbonators (see Note 2)

m) Swimming pools, spas and fountains

n) Treated grey water

o) Air handling unit humidifiers without chemicals

Notes:
1. The examples given are not an exhaustive list. Where here is doubt comparison must be made to the hazard definitions.
2. For carbonated drink dispensers, the pipework material installed downstream of the *backflow prevention device* shall not be made of copper and not be affected by carbon dioxide gas.

3.3.3 Low hazard

Any condition, device or practice which, in connection with the *potable water supply system,* would constitute a nuisance, by colour, odour or taste, but not injure or endanger health.

COMMENT:
Low hazard may include but not necessarily be limited to:

a) Drink dispensers (except carbonators)

b) Drinking fountains and bottle fillers

c) Rainwater tanks and supply systems (see **Note 2**)

d) External hose taps, with no hazards within 18 m

e) Emergency eye wash and shower stations

Notes:
1. The examples given are not an exhaustive list. Where there is doubt comparison must be made to the hazard definitions.
2. Air gap separation is the recommended type of backflow prevention for a rainwater tank with a *potable water* supply connection.

3.4 Backflow Protection

3.4.1 *Backflow* protection shall be provided where it is possible for water or *contaminants* to *backflow* into the *potable water supply system.*

COMMENT:
The protection of non-*potable water* used for personal hygiene is contained in Paragraph 4.1.

3.4.2 *Backflow* protection shall be determined by identifying the individual *cross connection* hazard(s) and *backflow* protection required. Water from each hazard shall be regarded as non-*potable* until an appropriate *backflow* protection is installed.

3.4.3 *Backflow* protection shall be achieved by:

a) An *air gap,* in accordance with Paragraph 3.5, or

b) A *backflow prevention device* selected in accordance with Paragraphs 3.4.4 and 3.4.5, or

c) A *backflow prevention device* provided as an integral part of a fixture, appliance or apparatus that is appropriate for the *cross connection* hazard.

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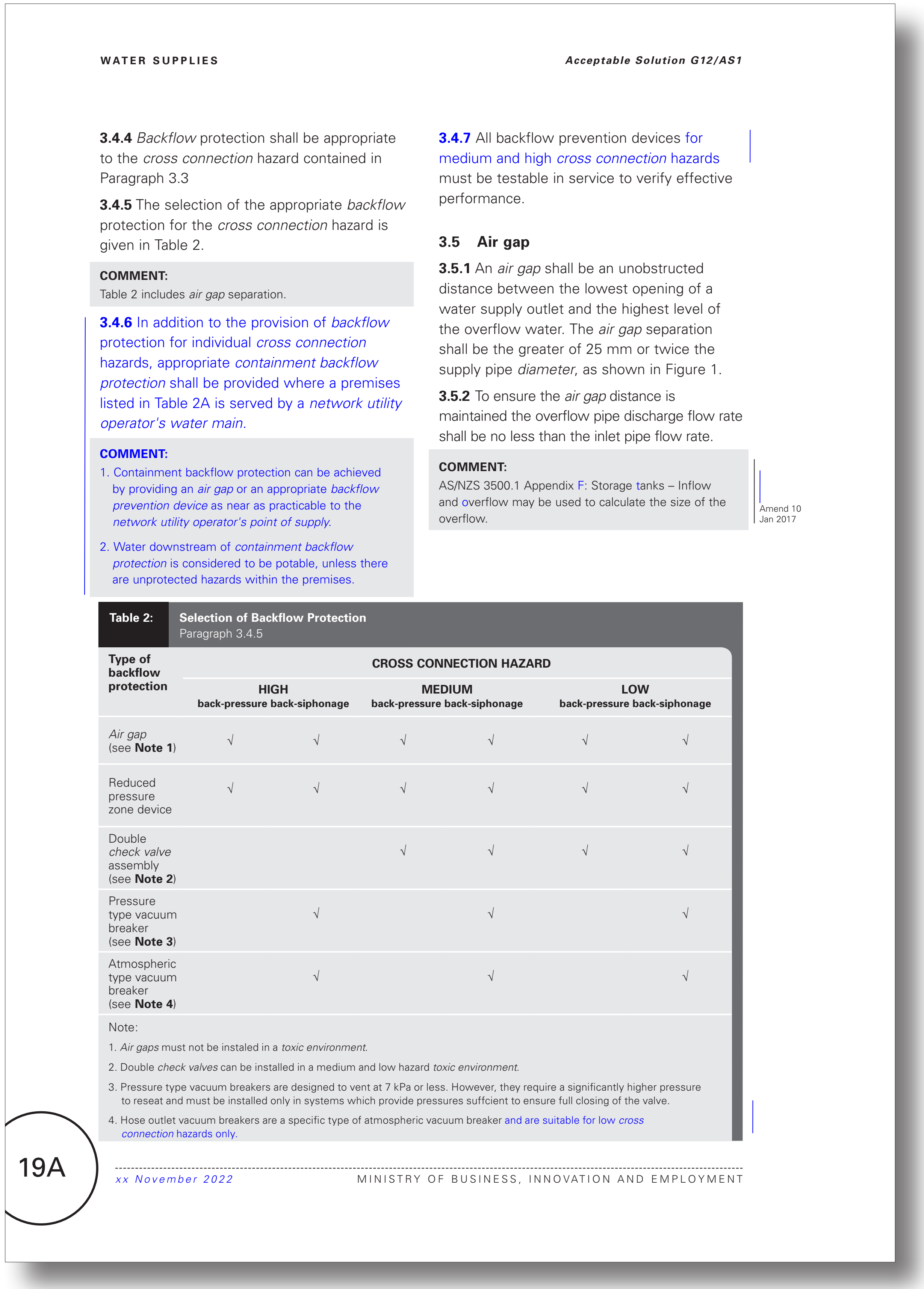
Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



3.4.4 *Backflow* protection shall be appropriate to the *cross connection* hazard contained in Paragraph 3.3

3.4.5 The selection of the appropriate *backflow* protection for the *cross connection* hazard is given in Table 2.

COMMENT:
Table 2 includes *air gap* separation.

3.4.6 In addition to the provision of *backflow* protection for individual *cross connection* hazards, appropriate *containment backflow protection* shall be provided where a premises listed in Table 2A is served by a *network utility operator's water main.*

COMMENT:

1. Containment backflow protection can be achieved by providing an *air gap* or an appropriate *backflow prevention device* as near as practicable to the *network utility operator's point of supply.*
2. Water downstream of *containment backflow protection* is considered to be potable, unless there are unprotected hazards within the premises.

3.4.7 All backflow prevention devices for medium and high *cross connection* hazards must be testable in service to verify effective performance.

3.5 Air gap

3.5.1 An *air gap* shall be an unobstructed distance between the lowest opening of a water supply outlet and the highest level of the overflow water. The *air gap* separation shall be the greater of 25 mm or twice the supply pipe *diameter*, as shown in Figure 1.

3.5.2 To ensure the *air gap* distance is maintained the overflow pipe discharge flow rate shall be no less than the inlet pipe flow rate.

COMMENT:
AS/NZS 3500.1 Appendix F: Storage tanks – Inflow and overflow may be used to calculate the size of the overflow.

Amend 10
Jan 2017

Table 2: **Selection of Backflow Protection**
Paragraph 3.4.5

Type of backflow protection	**CROSS CONNECTION HAZARD**					
	HIGH		**MEDIUM**		**LOW**	
	back-pressure	**back-siphonage**	**back-pressure**	**back-siphonage**	**back-pressure**	**back-siphonage**
Air gap (see **Note 1**)	√	√	√	√	√	√
Reduced pressure zone device	√	√	√	√	√	√
Double *check valve* assembly (see **Note 2**)			√	√	√	√
Pressure type vacuum breaker (see **Note 3**)		√		√		√
Atmospheric type vacuum breaker (see **Note 4**)		√		√		√

Note:

1. *Air gaps* must not be instaled in a *toxic environment*.
2. Double *check valves* can be installed in a medium and low hazard *toxic environment*.
3. Pressure type vacuum breakers are designed to vent at 7 kPa or less. However, they require a significantly higher pressure to reseat and must be installed only in systems which provide pressures suffcient to ensure full closing of the valve.
4. Hose outlet vacuum breakers are a specific type of atmospheric vacuum breaker and are suitable for low *cross connection* hazards only.

Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)

Acceptable Solution G12/AS1 WATER SUPPLIES

Table 2A: Containment Backflow Protection
Paragraph 3.4.6

Premises	**Hazard rating**	**Backflow prevention device**
Abattoirs	High	Air gap or RPZD
Car and plant washing facilities	High	Air gap or RPZD
Chemical laboratories	High	Air gap or RPZD
Chemical plants	High	Air gap or RPZD
Factories using, processing or manufacturing toxic chemicals	High	Air gap or RPZD
Hospitals, mortuaries, veterinary clinics and the like	High	Air gap or RPZD
Metal finishing plants	High	Air gap or RPZD
Pathology laboratories	High	Air gap or RPZD
Petroleum processing plants or storage plants	High	Air gap or RPZD
Piers, docks, marinas and other waterfront facilities	High	Air gap or RPZD
Premises where access to conduct inspections is restricted	High	Air gap or RPZD
Premises with an alternative water supply, excluding rainwater harvesting tanks	High	Air gap or RPZD
Sanitary depots	High	Air gap or RPZD
Sewage treatment plants and sewage lift stations	High	Air gap or RPZD
Timber treatment facilities	High	Air gap or RPZD
Universities	High	Air gap or RPZD
Caravan parks	Medium	Air gap or testable device
Food and beverage processing plants	Medium	Air gap or testable device
Premises with fire-fighting water services	Medium	Air gap or testable device
Premises with greywater re-use systems	Medium	Air gap or testable device
Premises with reticulated and disinfected reclaimed water systems	Medium	Air gap or testable device
Public swimming pools	Medium	Air gap or testable device
Premises with rainwater tanks	Low	Air gap, testable device or non-testable device
Notes: 1. *Air gaps* must not be installed in a *toxic environment*. 2. RPZD = Reduced pressure zone device.		

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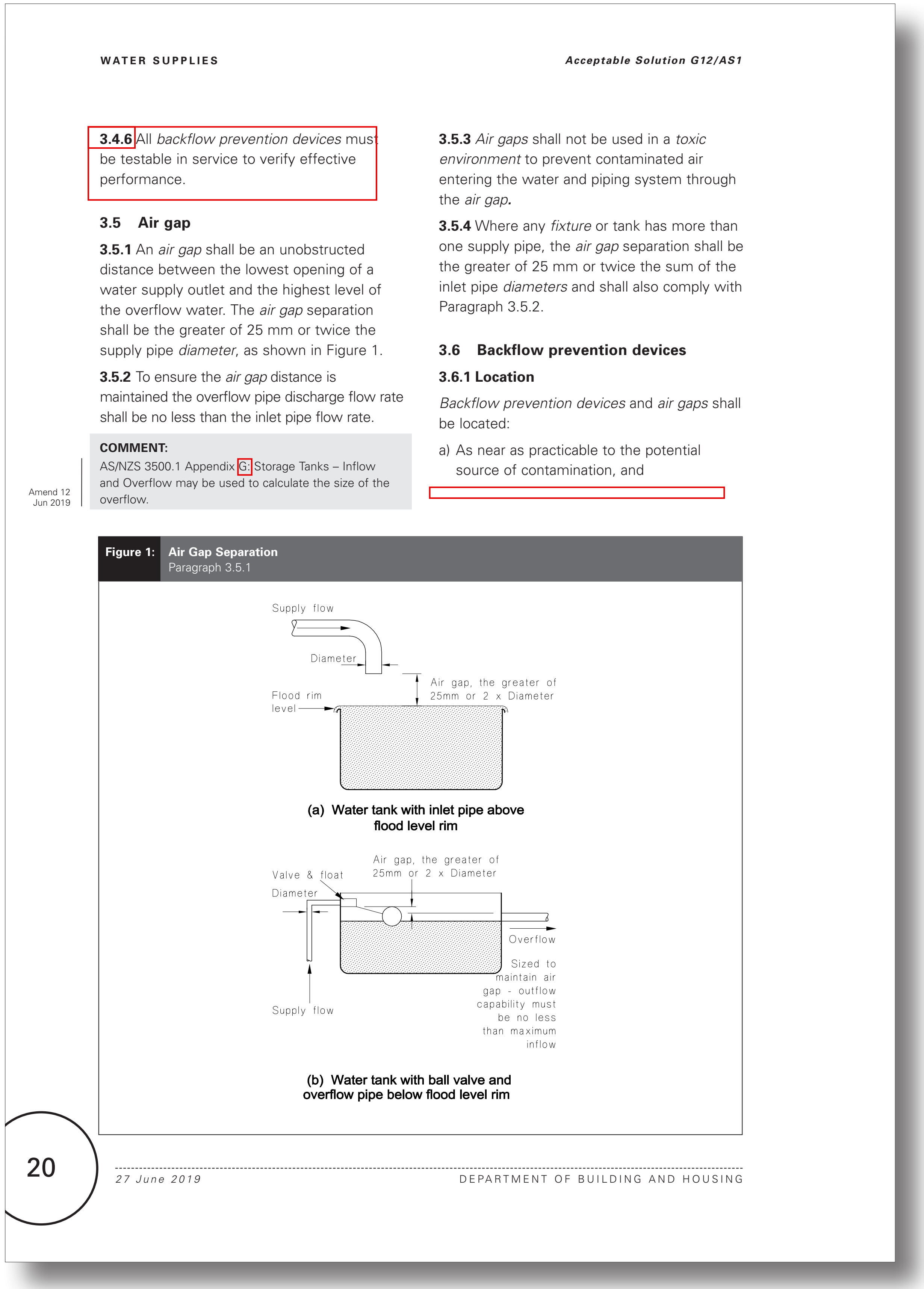
Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



WATER SUPPLIES

Acceptable Solution G12/AS1

3.4.6 All *backflow prevention devices* must be testable in service to verify effective performance.

3.5 Air gap

3.5.1 An *air gap* shall be an unobstructed distance between the lowest opening of a water supply outlet and the highest level of the overflow water. The *air gap* separation shall be the greater of 25 mm or twice the supply pipe *diameter*, as shown in Figure 1.

3.5.2 To ensure the *air gap* distance is maintained the overflow pipe discharge flow rate shall be no less than the inlet pipe flow rate.

COMMENT:
AS/NZS 3500.1 Appendix G: Storage Tanks – Inflow and Overflow may be used to calculate the size of the overflow.

Amend 12
Jun 2019

3.5.3 *Air gaps* shall not be used in a *toxic environment* to prevent contaminated air entering the water and piping system through the *air gap*.

3.5.4 Where any *fixture* or tank has more than one supply pipe, the *air gap* separation shall be the greater of 25 mm or twice the sum of the inlet pipe *diameters* and shall also comply with Paragraph 3.5.2.

3.6 Backflow prevention devices

3.6.1 Location

Backflow prevention devices and *air gaps* shall be located:

a) As near as practicable to the potential source of contamination, and

Figure 1: **Air Gap Separation**
Paragraph 3.5.1

(a) Water tank with inlet pipe above flood level rim

(b) Water tank with ball valve and overflow pipe below flood level rim

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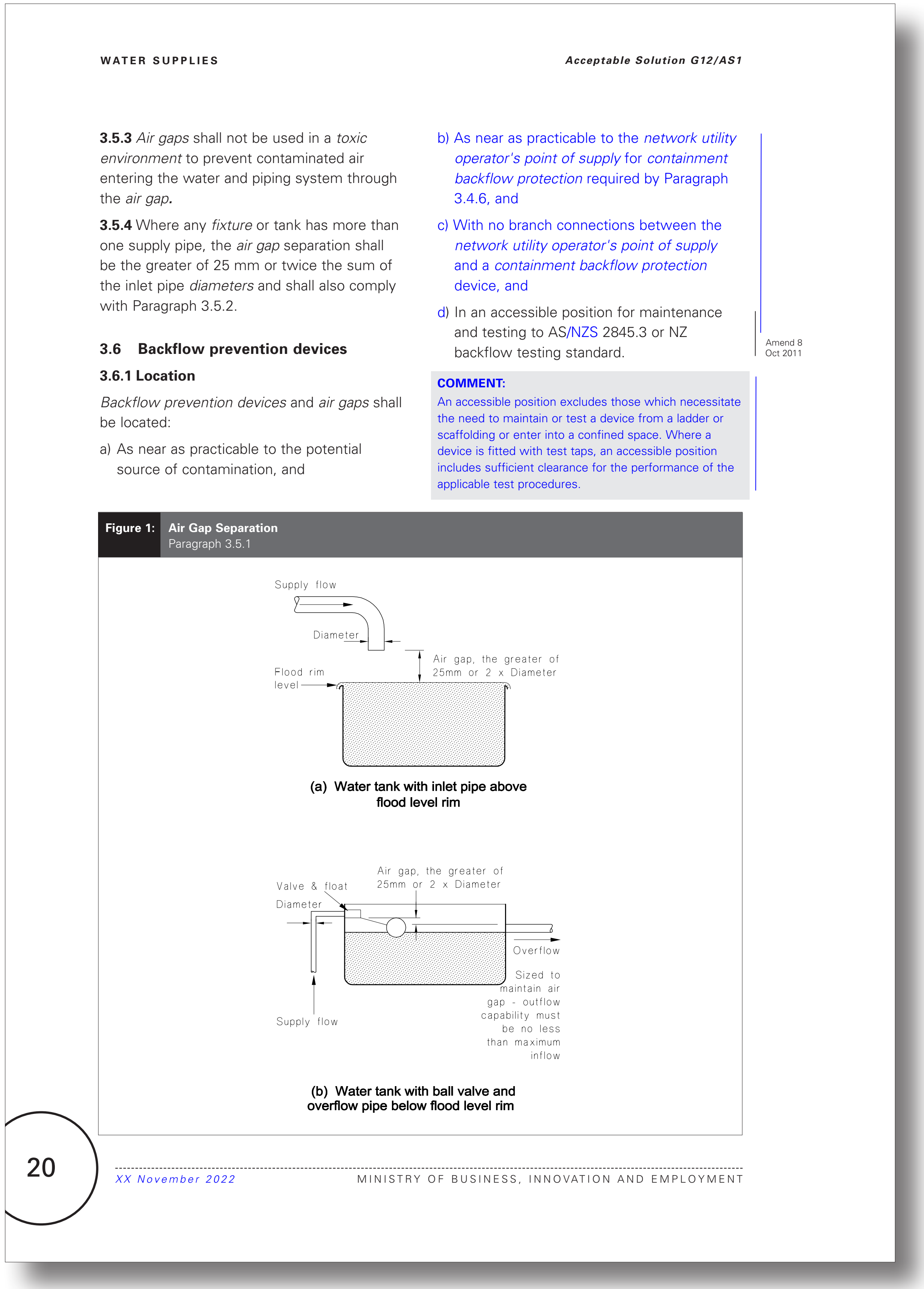
27 June 2019 DEPARTMENT OF BUILDING AND HOUSING

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods

(Proposed text in blue)



WATER SUPPLIES

Acceptable Solution G12/AS1

3.5.3 *Air gaps* shall not be used in a *toxic environment* to prevent contaminated air entering the water and piping system through the *air gap*.

3.5.4 Where any *fixture* or tank has more than one supply pipe, the *air gap* separation shall be the greater of 25 mm or twice the sum of the inlet pipe *diameters* and shall also comply with Paragraph 3.5.2.

3.6 Backflow prevention devices

3.6.1 Location

Backflow prevention devices and *air gaps* shall be located:

a) As near as practicable to the potential source of contamination, and

b) As near as practicable to the *network utility operator's point of supply* for *containment backflow protection* required by Paragraph 3.4.6, and

c) With no branch connections between the *network utility operator's point of supply* and a *containment backflow protection* device, and

d) In an accessible position for maintenance and testing to AS/NZS 2845.3 or NZ backflow testing standard.

Amend 8
Oct 2011

COMMENT:
An accessible position excludes those which necessitate the need to maintain or test a device from a ladder or scaffolding or enter into a confined space. Where a device is fitted with test taps, an accessible position includes sufficient clearance for the performance of the applicable test procedures.

Figure 1: **Air Gap Separation**
Paragraph 3.5.1

(a) Water tank with inlet pipe above flood level rim

(b) Water tank with ball valve and overflow pipe below flood level rim

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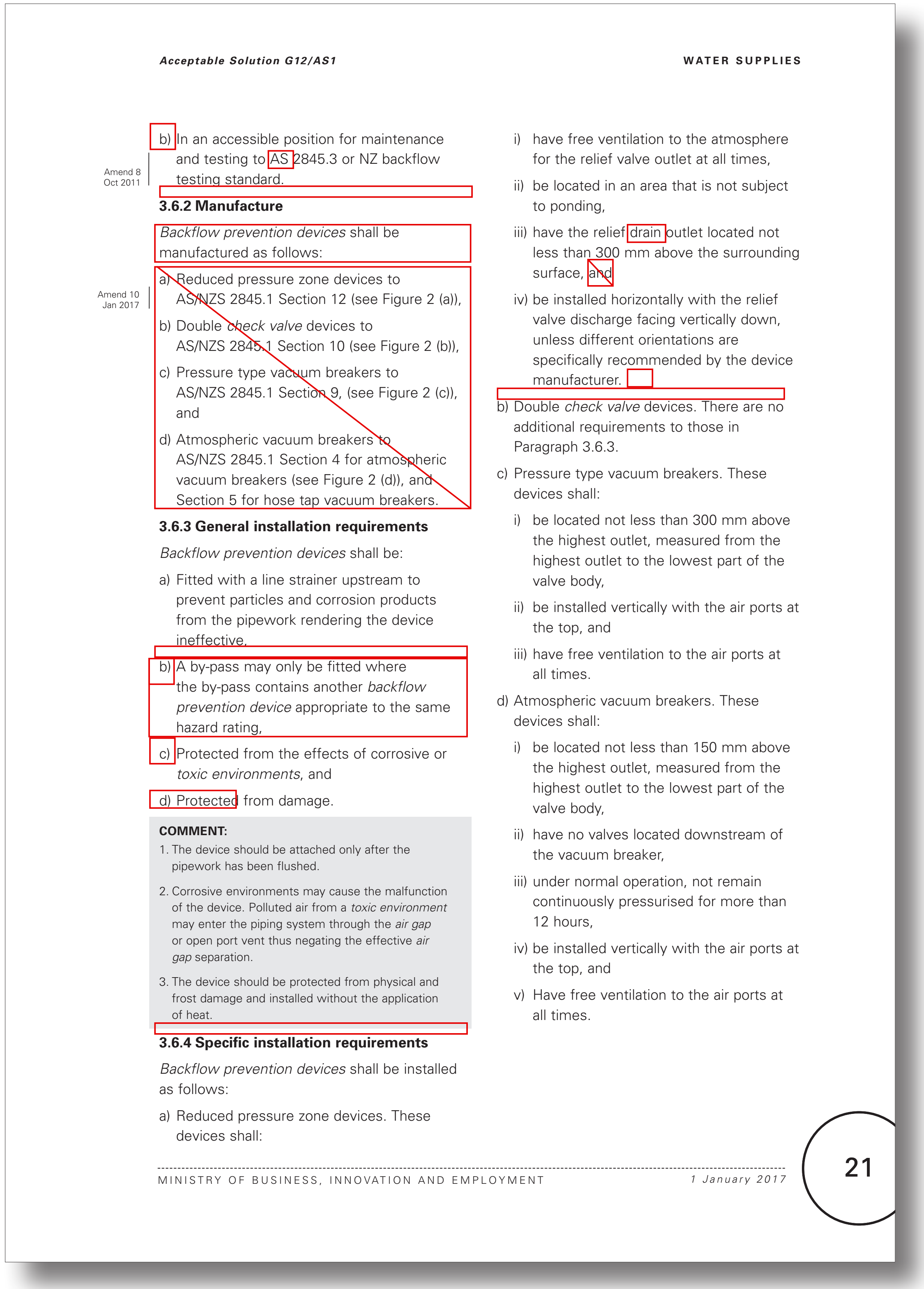
Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



Acceptable Solution G12/AS1 WATER SUPPLIES

b) In an accessible position for maintenance and testing to AS 2845.3 or NZ backflow testing standard.

Amend 8 Oct 2011

3.6.2 Manufacture

Backflow prevention devices shall be manufactured as follows:

Amend 10 Jan 2017

~~a) Reduced pressure zone devices to AS/NZS 2845.1 Section 12 (see Figure 2 (a)),~~

~~b) Double *check valve* devices to AS/NZS 2845.1 Section 10 (see Figure 2 (b)),~~

~~c) Pressure type vacuum breakers to AS/NZS 2845.1 Section 9, (see Figure 2 (c)), and~~

~~d) Atmospheric vacuum breakers to AS/NZS 2845.1 Section 4 for atmospheric vacuum breakers (see Figure 2 (d)), and Section 5 for hose tap vacuum breakers.~~

3.6.3 General installation requirements

Backflow prevention devices shall be:

a) Fitted with a line strainer upstream to prevent particles and corrosion products from the pipework rendering the device ineffective,

b) A by-pass may only be fitted where the by-pass contains another *backflow prevention device* appropriate to the same hazard rating,

c) Protected from the effects of corrosive or *toxic environments*, and

d) Protected from damage.

COMMENT:

1. The device should be attached only after the pipework has been flushed.
2. Corrosive environments may cause the malfunction of the device. Polluted air from a *toxic environment* may enter the piping system through the *air gap* or open port vent thus negating the effective *air gap* separation.
3. The device should be protected from physical and frost damage and installed without the application of heat.

3.6.4 Specific installation requirements

Backflow prevention devices shall be installed as follows:

a) Reduced pressure zone devices. These devices shall:

i) have free ventilation to the atmosphere for the relief valve outlet at all times,

ii) be located in an area that is not subject to ponding,

iii) have the relief drain outlet located not less than 300 mm above the surrounding surface, and

iv) be installed horizontally with the relief valve discharge facing vertically down, unless different orientations are specifically recommended by the device manufacturer.

b) Double *check valve* devices. There are no additional requirements to those in Paragraph 3.6.3.

c) Pressure type vacuum breakers. These devices shall:

i) be located not less than 300 mm above the highest outlet, measured from the highest outlet to the lowest part of the valve body,

ii) be installed vertically with the air ports at the top, and

iii) have free ventilation to the air ports at all times.

d) Atmospheric vacuum breakers. These devices shall:

i) be located not less than 150 mm above the highest outlet, measured from the highest outlet to the lowest part of the valve body,

ii) have no valves located downstream of the vacuum breaker,

iii) under normal operation, not remain continuously pressurised for more than 12 hours,

iv) be installed vertically with the air ports at the top, and

v) Have free ventilation to the air ports at all times.

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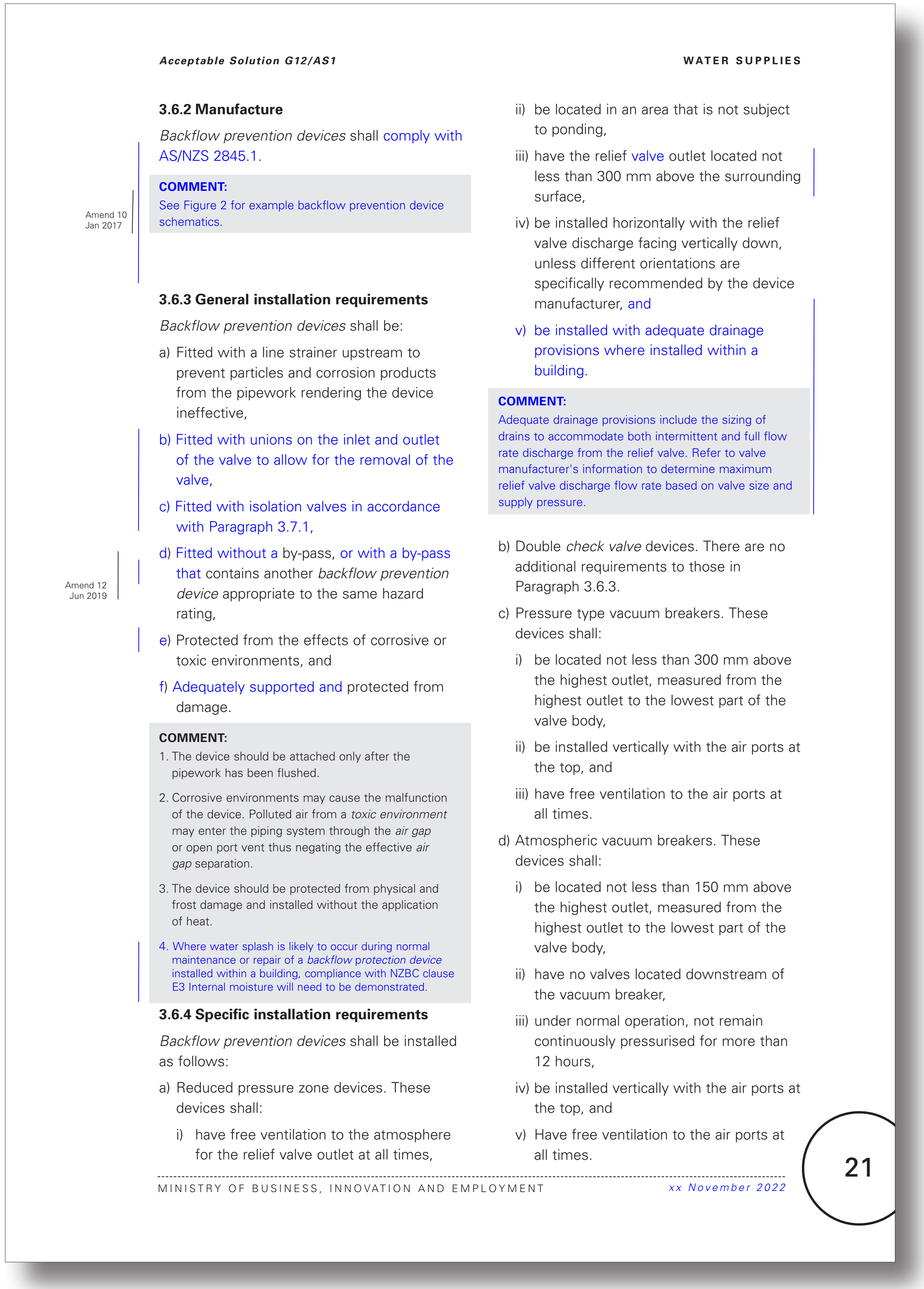
Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



Acceptable Solution G12/AS1 WATER SUPPLIES

3.6.2 Manufacture

Backflow prevention devices shall comply with AS/NZS 2845.1.

COMMENT:

See Figure 2 for example backflow prevention device schematics.

Amend 10 Jan 2017

3.6.3 General installation requirements

Backflow prevention devices shall be:

a) Fitted with a line strainer upstream to prevent particles and corrosion products from the pipework rendering the device ineffective,

b) Fitted with unions on the inlet and outlet of the valve to allow for the removal of the valve,

c) Fitted with isolation valves in accordance with Paragraph 3.7.1,

d) Fitted without a by-pass, or with a by-pass that contains another *backflow prevention device* appropriate to the same hazard rating,

Amend 12 Jun 2019

e) Protected from the effects of corrosive or toxic environments, and

f) Adequately supported and protected from damage.

COMMENT:

1. The device should be attached only after the pipework has been flushed.
2. Corrosive environments may cause the malfunction of the device. Polluted air from a *toxic environment* may enter the piping system through the *air gap* or open port vent thus negating the effective *air gap* separation.
3. The device should be protected from physical and frost damage and installed without the application of heat.
4. Where water splash is likely to occur during normal maintenance or repair of a *backflow protection device* installed within a building, compliance with NZBC clause E3 Internal moisture will need to be demonstrated.

3.6.4 Specific installation requirements

Backflow prevention devices shall be installed as follows:

a) Reduced pressure zone devices. These devices shall:

i) have free ventilation to the atmosphere for the relief valve outlet at all times,

ii) be located in an area that is not subject to ponding,

iii) have the relief valve outlet located not less than 300 mm above the surrounding surface,

iv) be installed horizontally with the relief valve discharge facing vertically down, unless different orientations are specifically recommended by the device manufacturer, and

v) be installed with adequate drainage provisions where installed within a building.

COMMENT:

Adequate drainage provisions include the sizing of drains to accommodate both intermittent and full flow rate discharge from the relief valve. Refer to valve manufacturer's information to determine maximum relief valve discharge flow rate based on valve size and supply pressure.

b) Double *check valve* devices. There are no additional requirements to those in Paragraph 3.6.3.

c) Pressure type vacuum breakers. These devices shall:

i) be located not less than 300 mm above the highest outlet, measured from the highest outlet to the lowest part of the valve body,

ii) be installed vertically with the air ports at the top, and

iii) have free ventilation to the air ports at all times.

d) Atmospheric vacuum breakers. These devices shall:

i) be located not less than 150 mm above the highest outlet, measured from the highest outlet to the lowest part of the valve body,

ii) have no valves located downstream of the vacuum breaker,

iii) under normal operation, not remain continuously pressurised for more than 12 hours,

iv) be installed vertically with the air ports at the top, and

v) Have free ventilation to the air ports at all times.

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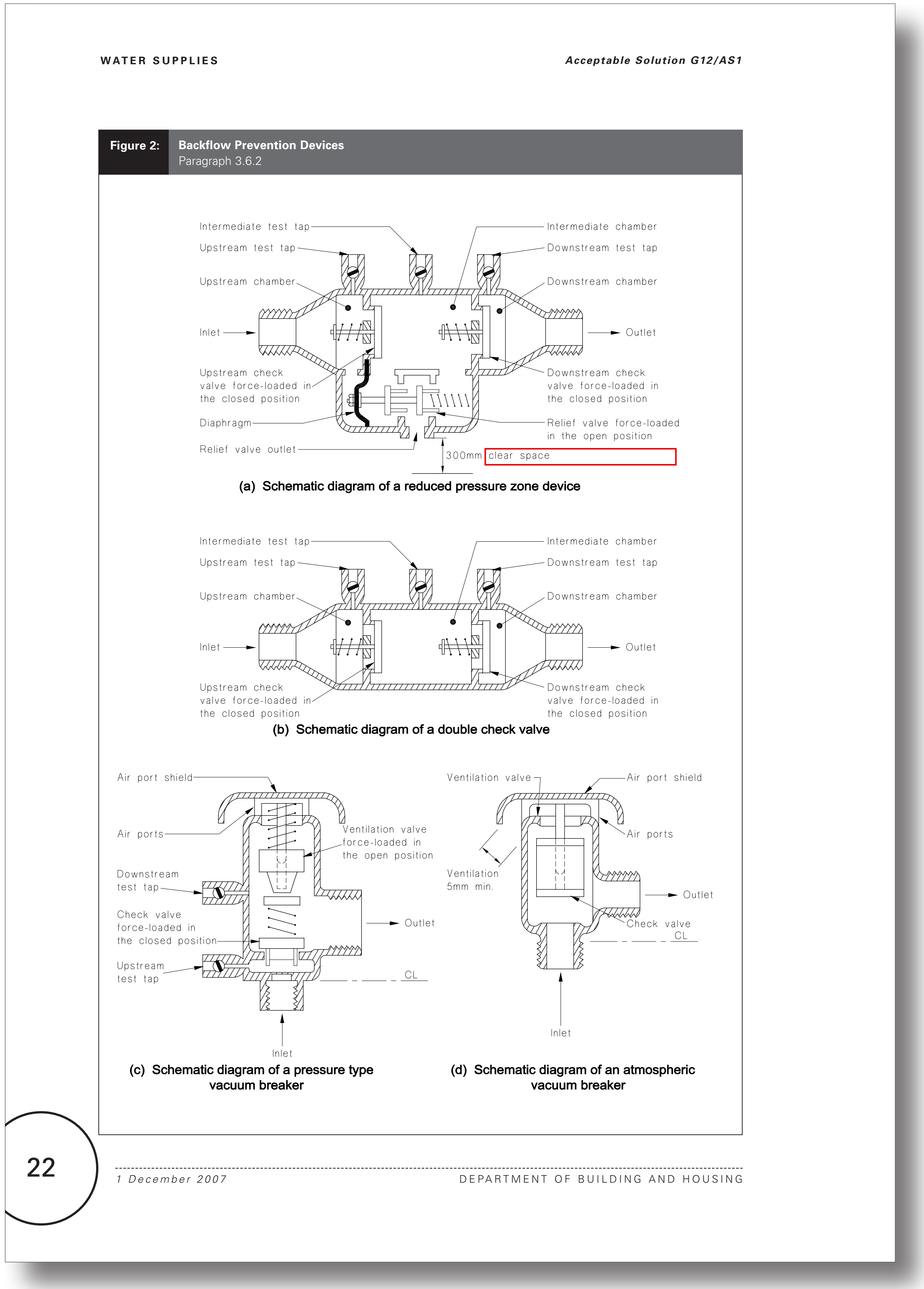
Current G12 Water Supplies acceptable solutions and verification methods
(Text to be amended shown in red)



WATER SUPPLIES

Acceptable Solution G12/AS1

Figure 2: **Backflow Prevention Devices**
Paragraph 3.6.2

(a) Schematic diagram of a reduced pressure zone device

(b) Schematic diagram of a double check valve

(c) Schematic diagram of a pressure type vacuum breaker

(d) Schematic diagram of an atmospheric vacuum breaker

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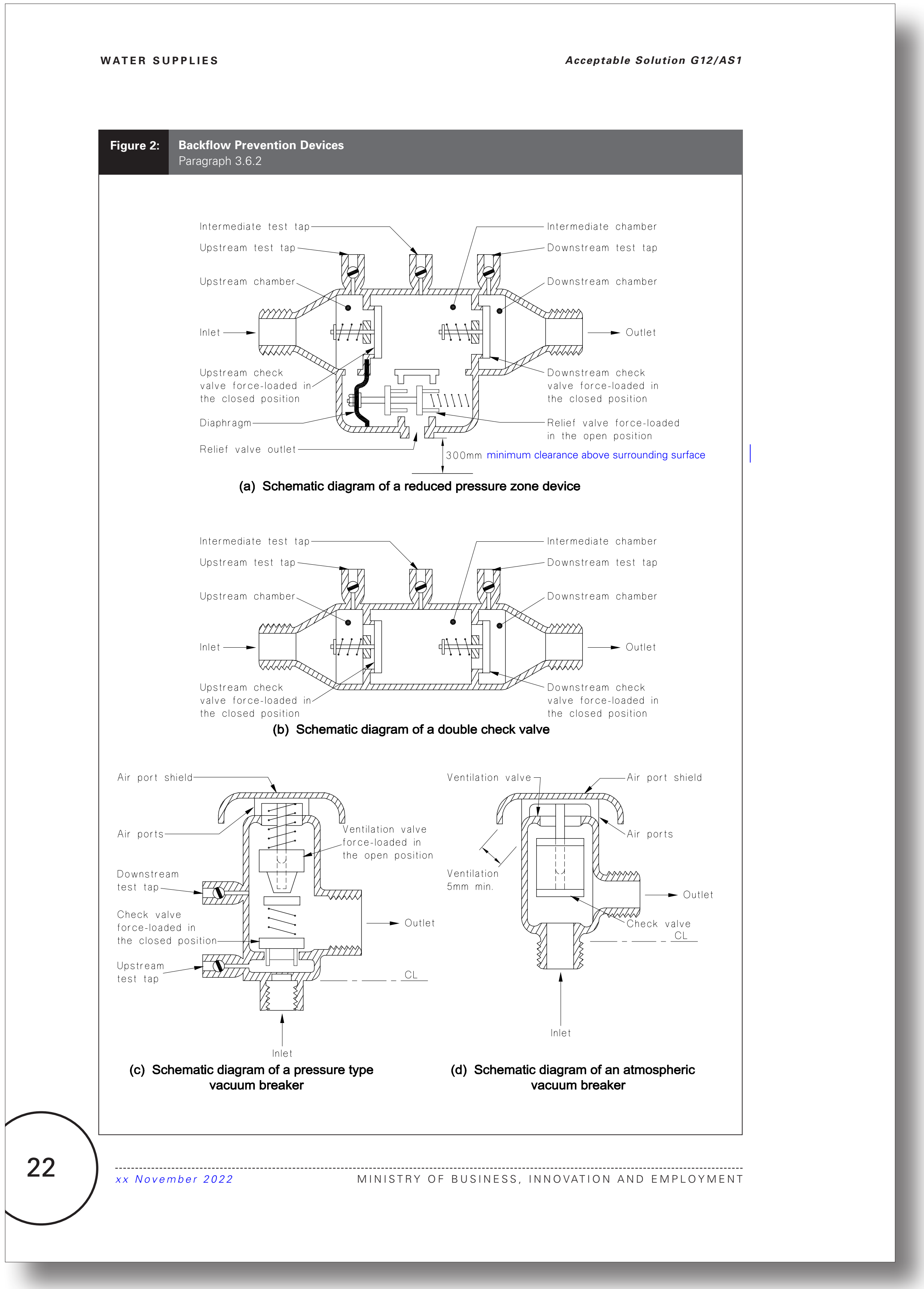
1 December 2007

DEPARTMENT OF BUILDING AND HOUSING

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



WATER SUPPLIES

Acceptable Solution G12/AS1

Figure 2: **Backflow Prevention Devices**
Paragraph 3.6.2

(a) Schematic diagram of a reduced pressure zone device

(b) Schematic diagram of a double check valve

(c) Schematic diagram of a pressure type vacuum breaker

(d) Schematic diagram of an atmospheric vacuum breaker

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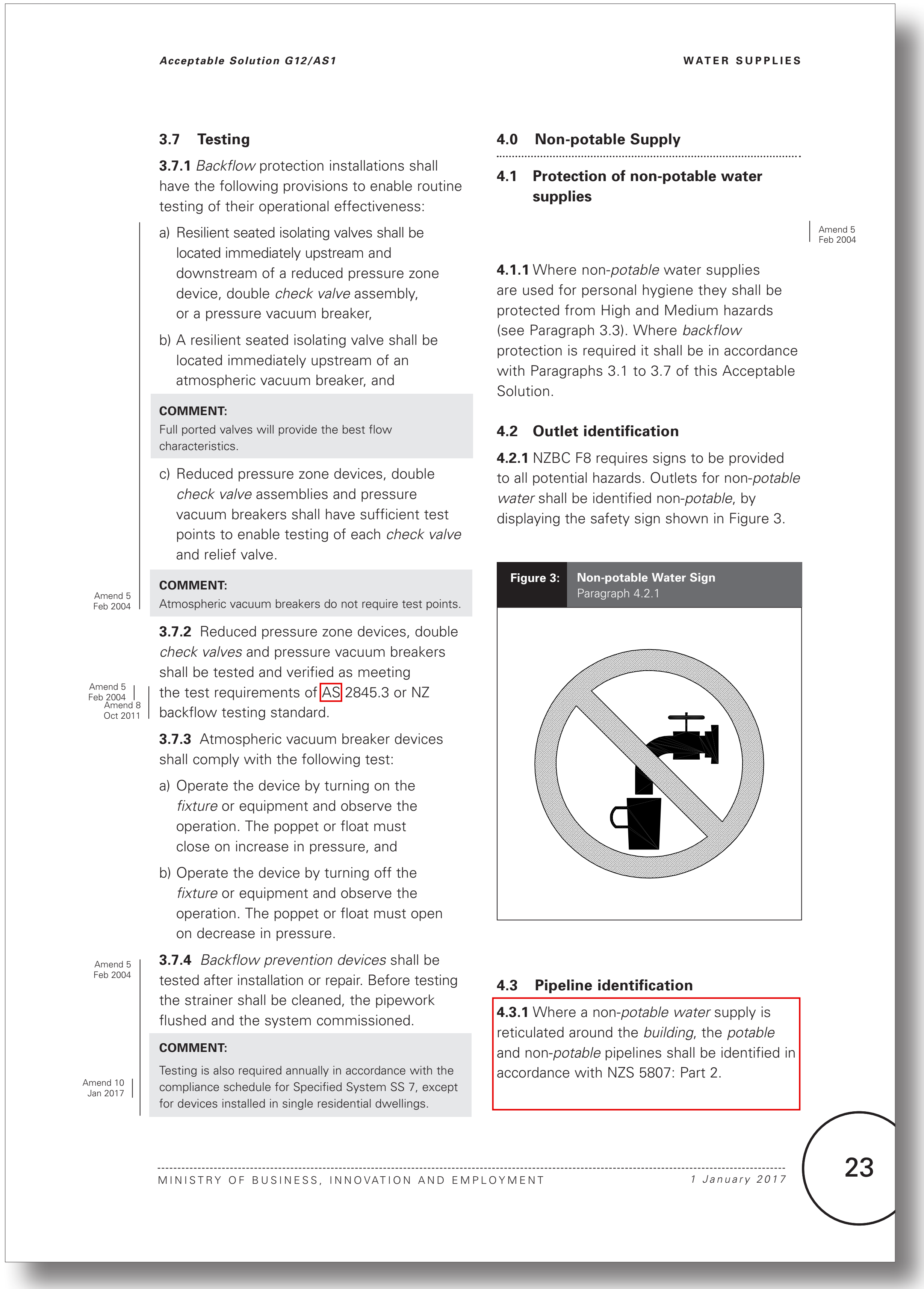
xx November 2022

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Appendix B. Proposed changes to the acceptable solutions and verification methods for clause G12 Water Supplies

Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



Acceptable Solution G12/AS1 WATER SUPPLIES

3.7 Testing

3.7.1 *Backflow* protection installations shall have the following provisions to enable routine testing of their operational effectiveness:

a) Resilient seated isolating valves shall be located immediately upstream and downstream of a reduced pressure zone device, double *check valve* assembly, or a pressure vacuum breaker,

b) A resilient seated isolating valve shall be located immediately upstream of an atmospheric vacuum breaker, and

COMMENT:
Full ported valves will provide the best flow characteristics.

c) Reduced pressure zone devices, double *check valve* assemblies and pressure vacuum breakers shall have sufficient test points to enable testing of each *check valve* and relief valve.

Amend 5 Feb 2004

COMMENT:
Atmospheric vacuum breakers do not require test points.

Amend 5 Feb 2004 Amend 8 Oct 2011

3.7.2 Reduced pressure zone devices, double *check valves* and pressure vacuum breakers shall be tested and verified as meeting the test requirements of AS 2845.3 or NZ backflow testing standard.

3.7.3 Atmospheric vacuum breaker devices shall comply with the following test:

a) Operate the device by turning on the *fixture* or equipment and observe the operation. The poppet or float must close on increase in pressure, and

b) Operate the device by turning off the *fixture* or equipment and observe the operation. The poppet or float must open on decrease in pressure.

Amend 5 Feb 2004

3.7.4 *Backflow prevention devices* shall be tested after installation or repair. Before testing the strainer shall be cleaned, the pipework flushed and the system commissioned.

Amend 10 Jan 2017

COMMENT:
Testing is also required annually in accordance with the compliance schedule for Specified System SS 7, except for devices installed in single residential dwellings.

4.0 Non-potable Supply

4.1 Protection of non-potable water supplies

Amend 5 Feb 2004

4.1.1 Where non-*potable* water supplies are used for personal hygiene they shall be protected from High and Medium hazards (see Paragraph 3.3). Where *backflow* protection is required it shall be in accordance with Paragraphs 3.1 to 3.7 of this Acceptable Solution.

4.2 Outlet identification

4.2.1 NZBC F8 requires signs to be provided to all potential hazards. Outlets for non-*potable water* shall be identified non-*potable*, by displaying the safety sign shown in Figure 3.

Figure 3: **Non-potable Water Sign**
Paragraph 4.2.1

4.3 Pipeline identification

4.3.1 Where a non-*potable water* supply is reticulated around the *building*, the *potable* and non-*potable* pipelines shall be identified in accordance with NZS 5807: Part 2.

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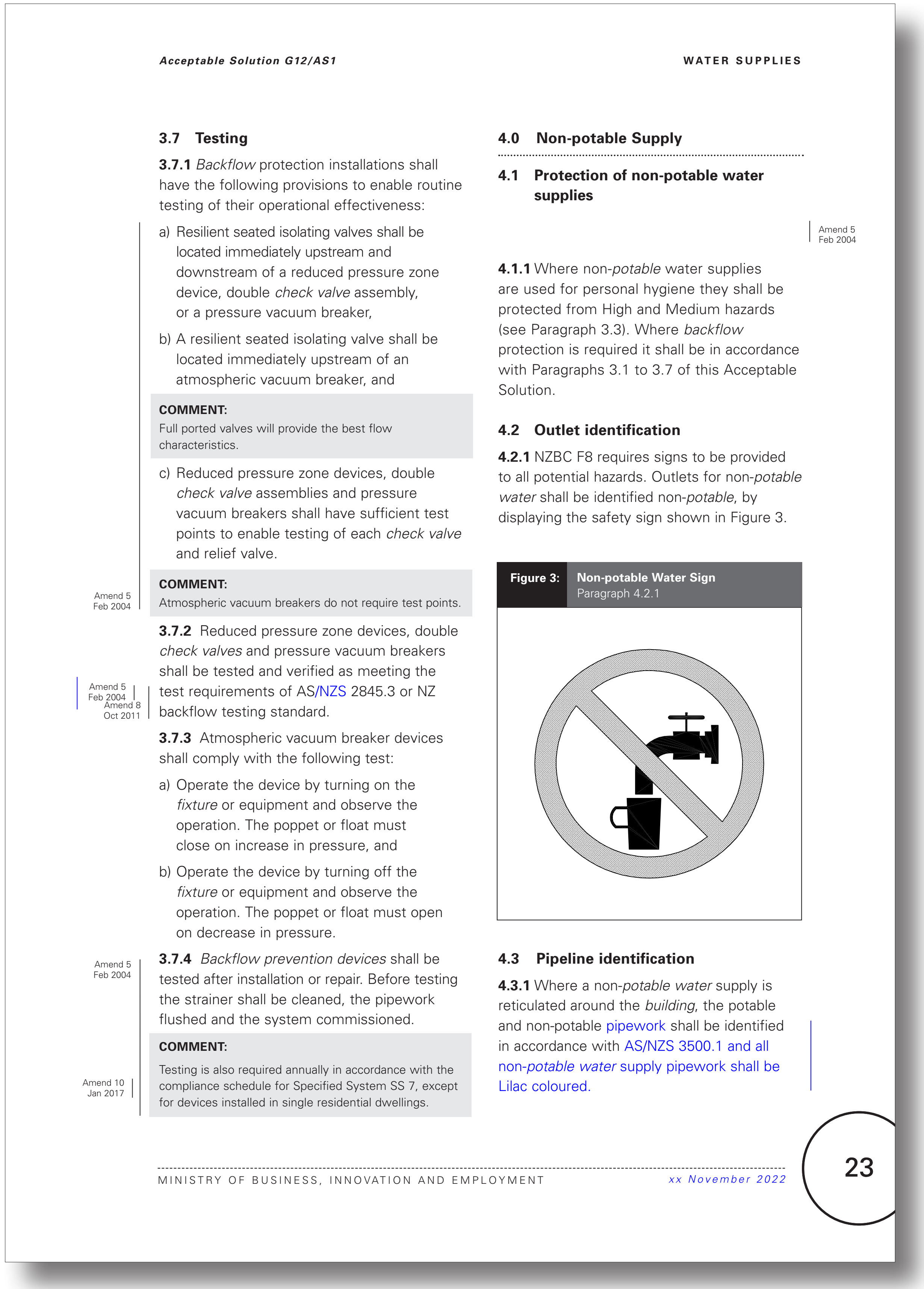
Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



Acceptable Solution G12/AS1 WATER SUPPLIES

3.7 Testing

3.7.1 *Backflow* protection installations shall have the following provisions to enable routine testing of their operational effectiveness:

a) Resilient seated isolating valves shall be located immediately upstream and downstream of a reduced pressure zone device, double *check valve* assembly, or a pressure vacuum breaker,

b) A resilient seated isolating valve shall be located immediately upstream of an atmospheric vacuum breaker, and

COMMENT:
Full ported valves will provide the best flow characteristics.

c) Reduced pressure zone devices, double *check valve* assemblies and pressure vacuum breakers shall have sufficient test points to enable testing of each *check valve* and relief valve.

Amend 5 Feb 2004

COMMENT:
Atmospheric vacuum breakers do not require test points.

Amend 5 Feb 2004 Amend 8 Oct 2011

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Amend 5 Feb 2004

3.7.4 *Backflow prevention devices* shall be tested after installation or repair. Before testing the strainer shall be cleaned, the pipework flushed and the system commissioned.

Amend 10 Jan 2017

COMMENT:
Testing is also required annually in accordance with the compliance schedule for Specified System SS 7, except for devices installed in single residential dwellings.

4.0 Non-potable Supply

4.1 Protection of non-potable water supplies

Amend 5 Feb 2004

4.1.1 Where non-*potable* water supplies are used for personal hygiene they shall be protected from High and Medium hazards (see Paragraph 3.3). Where *backflow* protection is required it shall be in accordance with Paragraphs 3.1 to 3.7 of this Acceptable Solution.

4.2 Outlet identification

4.2.1 NZBC F8 requires signs to be provided to all potential hazards. Outlets for non-*potable water* shall be identified non-*potable*, by displaying the safety sign shown in Figure 3.

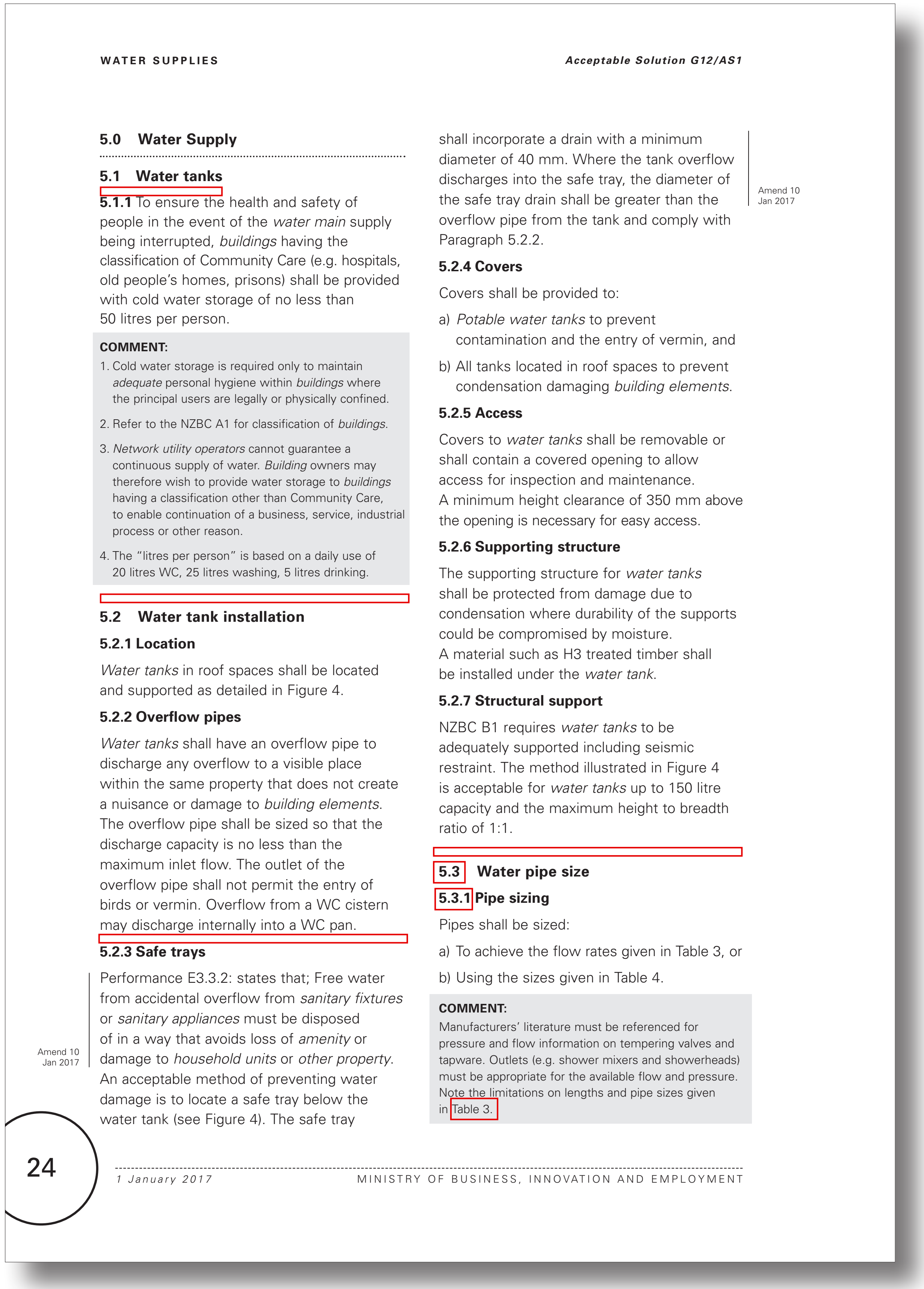
Figure 3: **Non-potable Water Sign**
Paragraph 4.2.1

4.3 Pipeline identification

4.3.1 Where a non-*potable water* supply is reticulated around the *building*, the potable and non-potable pipework shall be identified in accordance with AS/NZS 3500.1 and all non-*potable water* supply pipework shall be Lilac coloured.

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT *xx November 2022* 23

Current G12 Water Supplies acceptable solutions and verification methods (Text to be amended shown in red)



5.0 Water Supply

5.1 Water tanks

5.1.1 To ensure the health and safety of people in the event of the *water main* supply being interrupted, *buildings* having the classification of Community Care (e.g. hospitals, old people's homes, prisons) shall be provided with cold water storage of no less than 50 litres per person.

COMMENT:

1. Cold water storage is required only to maintain *adequate* personal hygiene within *buildings* where the principal users are legally or physically confined.
2. Refer to the NZBC A1 for classification of *buildings*.
3. *Network utility operators* cannot guarantee a continuous supply of water. *Building* owners may therefore wish to provide water storage to *buildings* having a classification other than Community Care, to enable continuation of a business, service, industrial process or other reason.
4. The "litres per person" is based on a daily use of 20 litres WC, 25 litres washing, 5 litres drinking.

5.2 Water tank installation

5.2.1 Location

Water tanks in roof spaces shall be located and supported as detailed in Figure 4.

5.2.2 Overflow pipes

Water tanks shall have an overflow pipe to discharge any overflow to a visible place within the same property that does not create a nuisance or damage to *building elements*. The overflow pipe shall be sized so that the discharge capacity is no less than the maximum inlet flow. The outlet of the overflow pipe shall not permit the entry of birds or vermin. Overflow from a WC cistern may discharge internally into a WC pan.

5.2.3 Safe trays

Amend 10 Jan 2017

Performance E3.3.2: states that; Free water from accidental overflow from *sanitary fixtures* or *sanitary appliances* must be disposed of in a way that avoids loss of *amenity* or damage to *household units* or *other property*. An acceptable method of preventing water damage is to locate a safe tray below the water tank (see Figure 4). The safe tray shall incorporate a drain with a minimum diameter of 40 mm. Where the tank overflow discharges into the safe tray, the diameter of the safe tray drain shall be greater than the overflow pipe from the tank and comply with Paragraph 5.2.2.

Amend 10 Jan 2017

5.2.4 Covers

Covers shall be provided to:

a) *Potable water tanks* to prevent contamination and the entry of vermin, and

b) All tanks located in roof spaces to prevent condensation damaging *building elements*.

5.2.5 Access

Covers to *water tanks* shall be removable or shall contain a covered opening to allow access for inspection and maintenance. A minimum height clearance of 350 mm above the opening is necessary for easy access.

5.2.6 Supporting structure

The supporting structure for *water tanks* shall be protected from damage due to condensation where durability of the supports could be compromised by moisture. A material such as H3 treated timber shall be installed under the *water tank*.

5.2.7 Structural support

NZBC B1 requires *water tanks* to be adequately supported including seismic restraint. The method illustrated in Figure 4 is acceptable for *water tanks* up to 150 litre capacity and the maximum height to breadth ratio of 1:1.

5.3 Water pipe size

5.3.1 **Pipe sizing**

Pipes shall be sized:

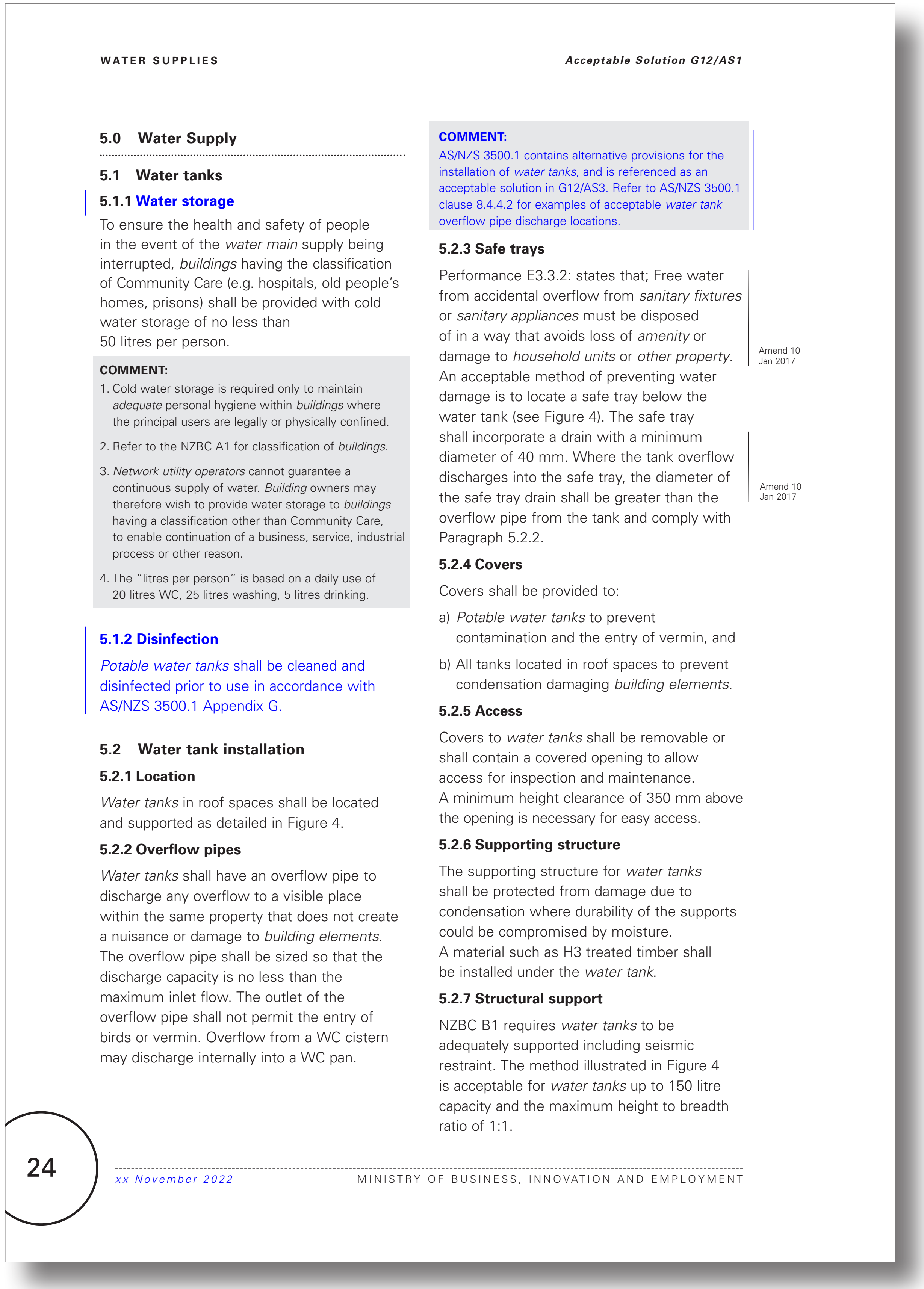
a) To achieve the flow rates given in Table 3, or

b) Using the sizes given in Table 4.

COMMENT:

Manufacturers' literature must be referenced for pressure and flow information on tempering valves and tapware. Outlets (e.g. shower mixers and showerheads) must be appropriate for the available flow and pressure. Note the limitations on lengths and pipe sizes given in Table 3.

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



5.0 Water Supply

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COMMENT:

1. Cold water storage is required only to maintain *adequate* personal hygiene within *buildings* where the principal users are legally or physically confined.
2. Refer to the NZBC A1 for classification of *buildings*.
3. *Network utility operators* cannot guarantee a continuous supply of water. *Building* owners may therefore wish to provide water storage to *buildings* having a classification other than Community Care, to enable continuation of a business, service, industrial process or other reason.
4. The "litres per person" is based on a daily use of 20 litres WC, 25 litres washing, 5 litres drinking.

5.1.2 Disinfection

Potable water tanks shall be cleaned and disinfected prior to use in accordance with AS/NZS 3500.1 Appendix G.

5.2 Water tank installation

5.2.1 Location

Water tanks in roof spaces shall be located and supported as detailed in Figure 4.

5.2.2 Overflow pipes

Water tanks shall have an overflow pipe to discharge any overflow to a visible place within the same property that does not create a nuisance or damage to *building elements*. The overflow pipe shall be sized so that the discharge capacity is no less than the maximum inlet flow. The outlet of the overflow pipe shall not permit the entry of birds or vermin. Overflow from a WC cistern may discharge internally into a WC pan.

COMMENT:

AS/NZS 3500.1 contains alternative provisions for the installation of *water tanks*, and is referenced as an acceptable solution in G12/AS3. Refer to AS/NZS 3500.1 clause 8.4.4.2 for examples of acceptable *water tank* overflow pipe discharge locations.

5.2.3 Safe trays

Performance E3.3.2: states that; Free water from accidental overflow from *sanitary fixtures* or *sanitary appliances* must be disposed of in a way that avoids loss of *amenity* or damage to *household units* or *other property*. An acceptable method of preventing water damage is to locate a safe tray below the water tank (see Figure 4). The safe tray shall incorporate a drain with a minimum diameter of 40 mm. Where the tank overflow discharges into the safe tray, the diameter of the safe tray drain shall be greater than the overflow pipe from the tank and comply with Paragraph 5.2.2.

Amend 10 Jan 2017

Amend 10 Jan 2017

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The supporting structure for *water tanks* shall be protected from damage due to condensation where durability of the supports could be compromised by moisture. A material such as H3 treated timber shall be installed under the *water tank*.

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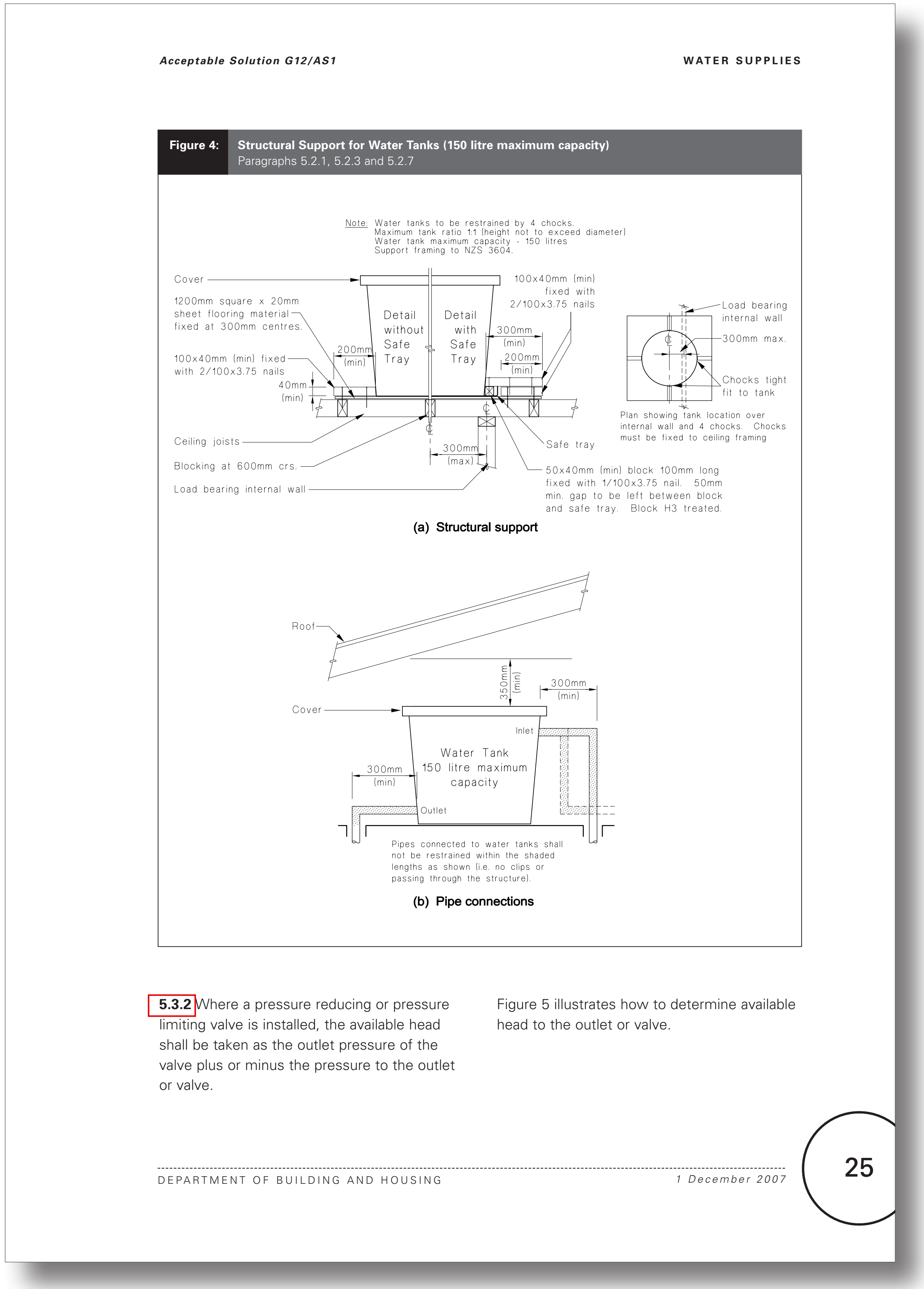
NZBC B1 requires *water tanks* to be adequately supported including seismic restraint. The method illustrated in Figure 4 is acceptable for *water tanks* up to 150 litre capacity and the maximum height to breadth ratio of 1:1.

Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



Acceptable Solution G12/AS1

WATER SUPPLIES

Figure 4: Structural Support for Water Tanks (150 litre maximum capacity)
Paragraphs 5.2.1, 5.2.3 and 5.2.7

Note: Water tanks to be restrained by 4 chocks.
Maximum tank ratio 1:1 (height not to exceed diameter)
Water tank maximum capacity - 150 litres
Support framing to NZS 3604.

(a) Structural support

Pipes connected to water tanks shall not be restrained within the shaded lengths as shown (i.e. no clips or passing through the structure).

(b) Pipe connections

5.3.2 Where a pressure reducing or pressure limiting valve is installed, the available head shall be taken as the outlet pressure of the valve plus or minus the pressure to the outlet or valve.

Figure 5 illustrates how to determine available head to the outlet or valve.

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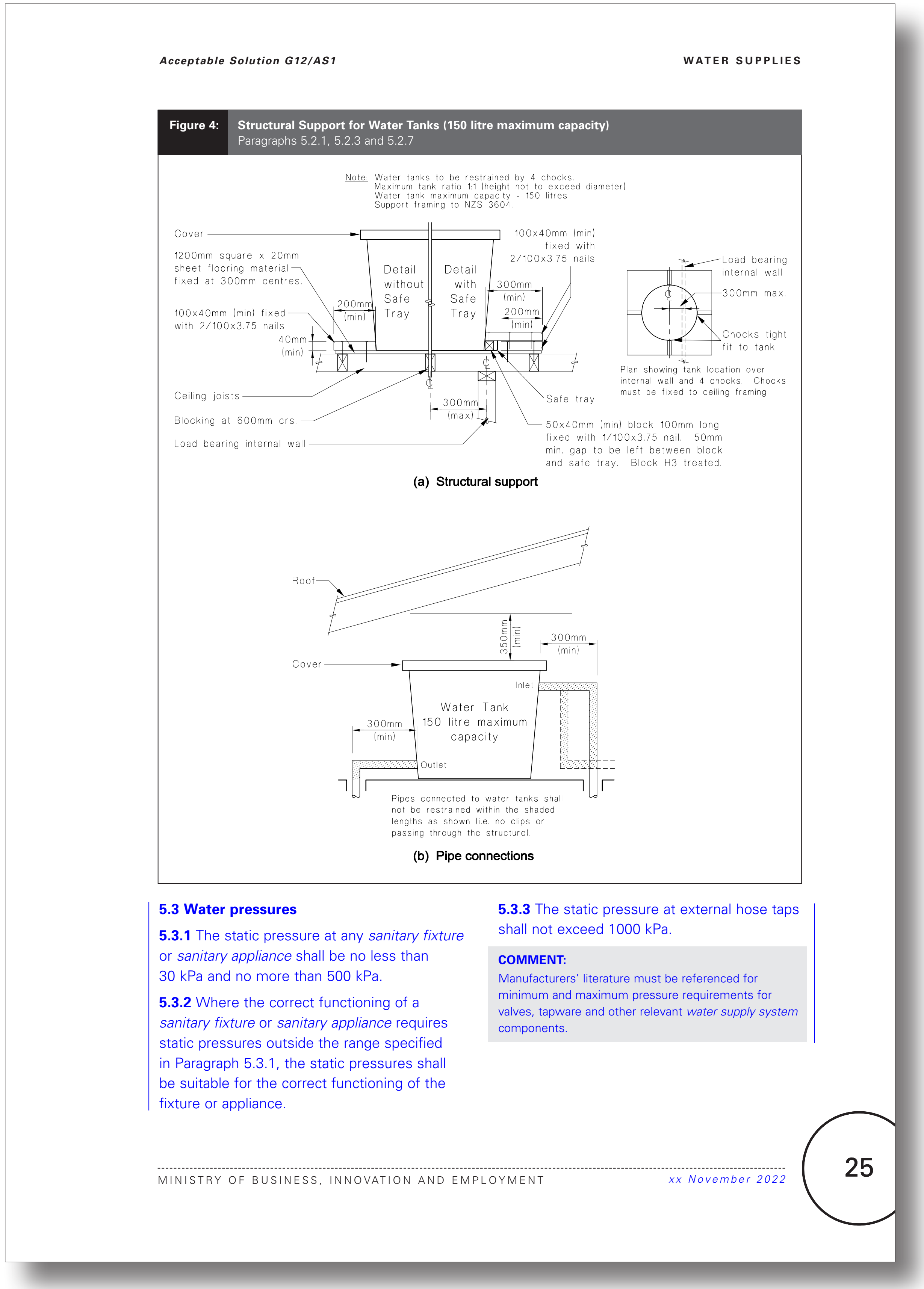
Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



Acceptable Solution G12/AS1

WATER SUPPLIES

Figure 4: Structural Support for Water Tanks (150 litre maximum capacity)
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Note: Water tanks to be restrained by 4 chocks.
Maximum tank ratio 1:1 (height not to exceed diameter)
Water tank maximum capacity - 150 litres
Support framing to NZS 3604.

(a) Structural support

Pipes connected to water tanks shall not be restrained within the shaded lengths as shown (i.e. no clips or passing through the structure).

(b) Pipe connections

5.3 Water pressures

5.3.1 The static pressure at any *sanitary fixture* or *sanitary appliance* shall be no less than 30 kPa and no more than 500 kPa.

5.3.2 Where the correct functioning of a *sanitary fixture* or *sanitary appliance* requires static pressures outside the range specified in Paragraph 5.3.1, the static pressures shall be suitable for the correct functioning of the fixture or appliance.

5.3.3 The static pressure at external hose taps shall not exceed 1000 kPa.

COMMENT:
Manufacturers' literature must be referenced for minimum and maximum pressure requirements for valves, tapware and other relevant *water supply system* components.

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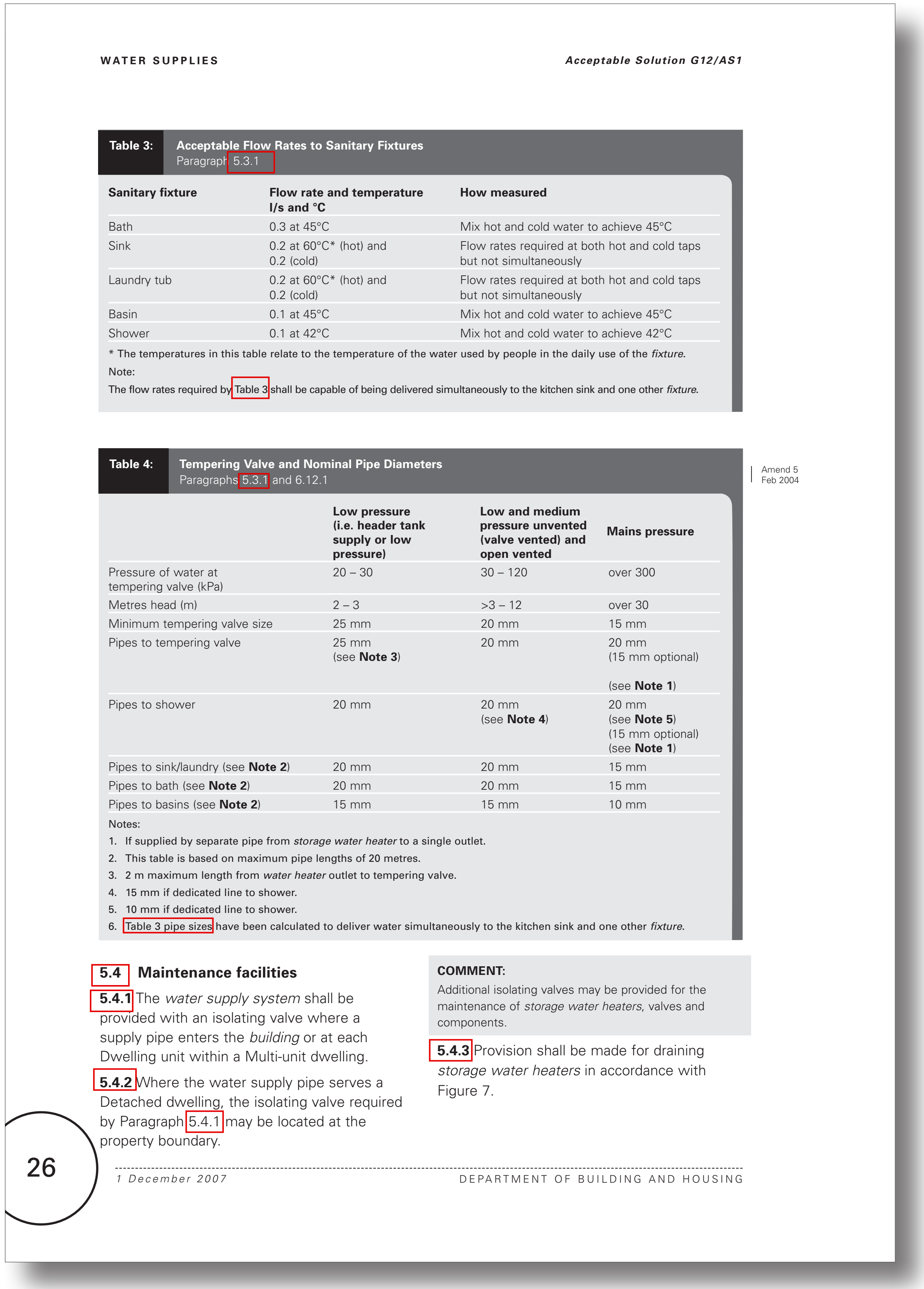
Current G12 Water Supplies acceptable solutions and verification methods (Text to be amended shown in red)



WATER SUPPLIES

Acceptable Solution G12/AS1

Table 3: Acceptable Flow Rates to Sanitary Fixtures
Paragraph 5.3.1

Sanitary fixture	Flow rate and temperature l/s and °C	How measured
Bath	0.3 at 45°C	Mix hot and cold water to achieve 45°C
Sink	0.2 at 60°C* (hot) and 0.2 (cold)	Flow rates required at both hot and cold taps but not simultaneously
Laundry tub	0.2 at 60°C* (hot) and 0.2 (cold)	Flow rates required at both hot and cold taps but not simultaneously
Basin	0.1 at 45°C	Mix hot and cold water to achieve 45°C
Shower	0.1 at 42°C	Mix hot and cold water to achieve 42°C

* The temperatures in this table relate to the temperature of the water used by people in the daily use of the *fixture*.

Note:

The flow rates required by Table 3 shall be capable of being delivered simultaneously to the kitchen sink and one other *fixture*.

Table 4: Tempering Valve and Nominal Pipe Diameters
Paragraphs 5.3.1 and 6.12.1

Amend 5 Feb 2004

	Low pressure (i.e. header tank supply or low pressure)	Low and medium pressure unvented (valve vented) and open vented	Mains pressure
Pressure of water at tempering valve (kPa)	20 – 30	30 – 120	over 300
Metres head (m)	2 – 3	>3 – 12	over 30
Minimum tempering valve size	25 mm	20 mm	15 mm
Pipes to tempering valve	25 mm (see **Note 3**)	20 mm	20 mm (15 mm optional) (see **Note 1**)
Pipes to shower	20 mm	20 mm (see **Note 4**)	20 mm (see **Note 5**) (15 mm optional) (see **Note 1**)
Pipes to sink/laundry (see **Note 2**)	20 mm	20 mm	15 mm
Pipes to bath (see **Note 2**)	20 mm	20 mm	15 mm
Pipes to basins (see **Note 2**)	15 mm	15 mm	10 mm

Notes:

1. If supplied by separate pipe from *storage water heater* to a single outlet.
2. This table is based on maximum pipe lengths of 20 metres.
3. 2 m maximum length from *water heater* outlet to tempering valve.
4. 15 mm if dedicated line to shower.
5. 10 mm if dedicated line to shower.
6. Table 3 pipe sizes have been calculated to deliver water simultaneously to the kitchen sink and one other *fixture*.

5.4 Maintenance facilities

5.4.1 The *water supply system* shall be provided with an isolating valve where a supply pipe enters the *building* or at each Dwelling unit within a Multi-unit dwelling.

5.4.2 Where the water supply pipe serves a Detached dwelling, the isolating valve required by Paragraph 5.4.1 may be located at the property boundary.

COMMENT:
Additional isolating valves may be provided for the maintenance of *storage water heaters*, valves and components.

5.4.3 Provision shall be made for draining *storage water heaters* in accordance with Figure 7.

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1 December 2007 DEPARTMENT OF BUILDING AND HOUSING

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)

WATER SUPPLIES

Acceptable Solution G12/AS1

5.4 Water pipe size

5.4.1 Pipe sizing

Pipes shall be sized:

a) To achieve the flow rates given in Table 3, or

b) Using the sizes given in Table 4.

COMMENT:
Manufacturers' literature must be referenced for pressure and flow information on tempering valves and tapware. Outlets (e.g. shower mixers and showerheads) must be appropriate for the available flow and pressure. Note the limitations on lengths and pipe sizes given in Table 4.

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Paragraph 5.4.1

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* The temperatures in this table relate to the temperature of the water used by people in the daily use of the *fixture*.

Note:

The flow rates required by this table shall be capable of being delivered simultaneously to the kitchen sink and one other *fixture*.

Table 4: Tempering Valve and Nominal Pipe Diameters
Paragraphs 5.4.1 and 6.12.1

Amend 5 Feb 2004

	Low pressure (i.e. header tank supply or low pressure)	Low and medium pressure unvented (valve vented) and open vented	Mains pressure
Pressure of water at tempering valve (kPa)	20 – 30	30 – 120	over 300
Metres head (m)	2 – 3	>3 – 12	over 30
Minimum tempering valve size	25 mm	20 mm	15 mm
Pipes to tempering valve	25 mm (see **Note 3**)	20 mm	20 mm (15 mm optional) (see **Note 1**)
Pipes to shower	20 mm	20 mm (see **Note 4**)	20 mm (see **Note 5**) (15 mm optional) (see **Note 1**)
Pipes to sink/laundry (see **Note 2**)	20 mm	20 mm	15 mm
Pipes to bath (see **Note 2**)	20 mm	20 mm	15 mm
Pipes to basins (see **Note 2**)	15 mm	15 mm	10 mm

Notes:

1. If supplied by separate pipe from *storage water heater* to a single outlet.
2. This table is based on maximum pipe lengths of 20 metres.
3. 2 m maximum length from *water heater* outlet to tempering valve.
4. 15 mm if dedicated line to shower.
5. 10 mm if dedicated line to shower.
6. Pipe sizes in this table have been calculated to deliver water simultaneously to the kitchen sink and one other *fixture*.

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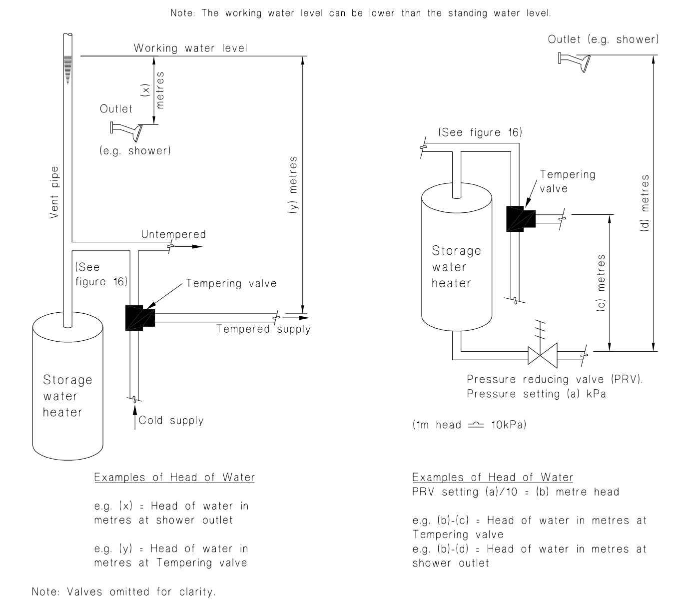
Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)

Acceptable Solution G12/AS1 WATER SUPPLIES

Figure 5: **Head of Water Available**
Paragraph 5.3.2



6.0 Hot Water Supply System

6.1 Water heaters

6.1.1 *Water heaters* shall comply with Table 5.

6.1.2 Hot *water supply systems* are given in Figures 6 to 11. (Note: Pipe insulation is not shown for clarity.)

6.2 Water supply to storage water heaters

6.2.1 *Storage water heaters* shall be supplied with cold water at a pressure not exceeding their working pressure by means of a:

Amend 5 Feb 2004

a) *Water tank,*

b) Pressure reducing valve,

c) Pressure limiting valve, or

d) Mains pressure supply.

Table 5: **Water Heaters**
Paragraph 6.1.1

Water heater type	Standard/Regulation
Electric low pressure copper *storage water heater*	NZS 4602
Electric *storage water heater*	NZS 4606: Parts 1, 2 and 3
Electric instantaneous *water heater*	AS/NZS 60335.2.35
Gas *storage water heater*	Gas Regulations
Gas instantaneous *water heater*	Gas Regulations
Solar *storage water heater*	NZS 4613 (see G12/AS2) AS/NZS 2712 (see G12/AS2)

Amend 7 Sep 2010

Amend 7 Sep 2010

Amend 9 Feb 2014

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Proposed amendments to G12 Water Supplies acceptable solutions and verification methods

(Proposed text in blue)

Acceptable Solution G12/AS1 WATER SUPPLIES

5.4.2 Where a pressure reducing or pressure limiting valve is installed, the available head shall be taken as the outlet pressure of the valve plus or minus the pressure to the outlet or valve. Figure 5 illustrates how to determine available head to the outlet or valve

5.5 Maintenance facilities

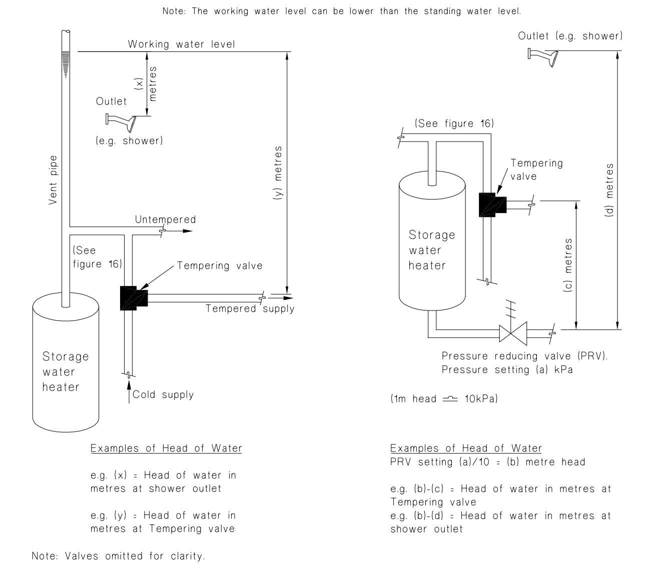
5.5.1 The *water supply system* shall be provided with an isolating valve where a supply pipe enters the *building* or at each Dwelling unit within a Multi-unit dwelling.

5.5.2 Where the water supply pipe serves a Detached dwelling, the isolating valve required by Paragraph 5.5.1 may be located at the property boundary.

COMMENT:
Additional isolating valves may be provided for the maintenance of *storage water heaters*, valves and components.

5.5.3 Provision shall be made for draining *storage water heaters* in accordance with Figure 7.

Figure 5: **Head of Water Available**
Paragraph 5.4.2



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6.2.1 *Storage water heaters* shall be supplied with cold water at a pressure not exceeding their working pressure by means of a:

a) *Water tank,*

b) Pressure reducing valve,

c) Pressure limiting valve, or

d) Mains pressure supply.

6.2.2 *Storage water heaters* supplied by other than a *water tank* shall include a *non-return valve* as shown in Figures 7, 8(a), 8(b), 9 and 10 to prevent the *storage water heater* emptying and hot water flowing into the cold water supply and thence from the cold water taps.

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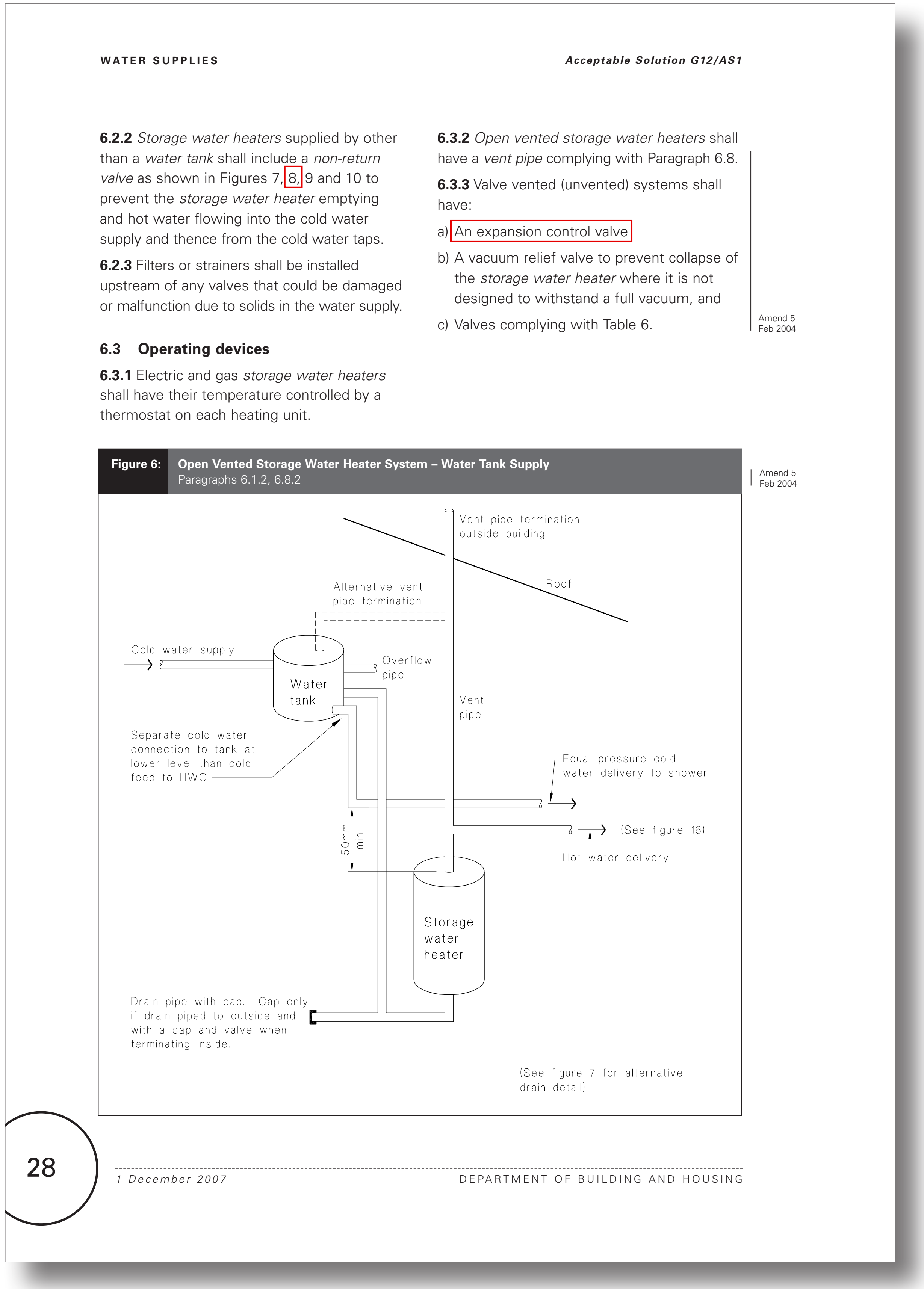
Current G12 Water Supplies acceptable solutions and verification methods
(Text to be amended shown in red)



WATER SUPPLIES | *Acceptable Solution G12/AS1*

6.2.2 *Storage water heaters* supplied by other than a *water tank* shall include a *non-return valve* as shown in Figures 7, 8, 9 and 10 to prevent the *storage water heater* emptying and hot water flowing into the cold water supply and thence from the cold water taps.

6.2.3 Filters or strainers shall be installed upstream of any valves that could be damaged or malfunction due to solids in the water supply.

6.3 Operating devices

6.3.1 Electric and gas *storage water heaters* shall have their temperature controlled by a thermostat on each heating unit.

6.3.2 *Open vented storage water heaters* shall have a *vent pipe* complying with Paragraph 6.8.

6.3.3 Valve vented (unvented) systems shall have:

a) An expansion control valve

b) A vacuum relief valve to prevent collapse of the *storage water heater* where it is not designed to withstand a full vacuum, and

c) Valves complying with Table 6.

Amend 5
Feb 2004

Figure 6: **Open Vented Storage Water Heater System – Water Tank Supply**
Paragraphs 6.1.2, 6.8.2

Amend 5
Feb 2004

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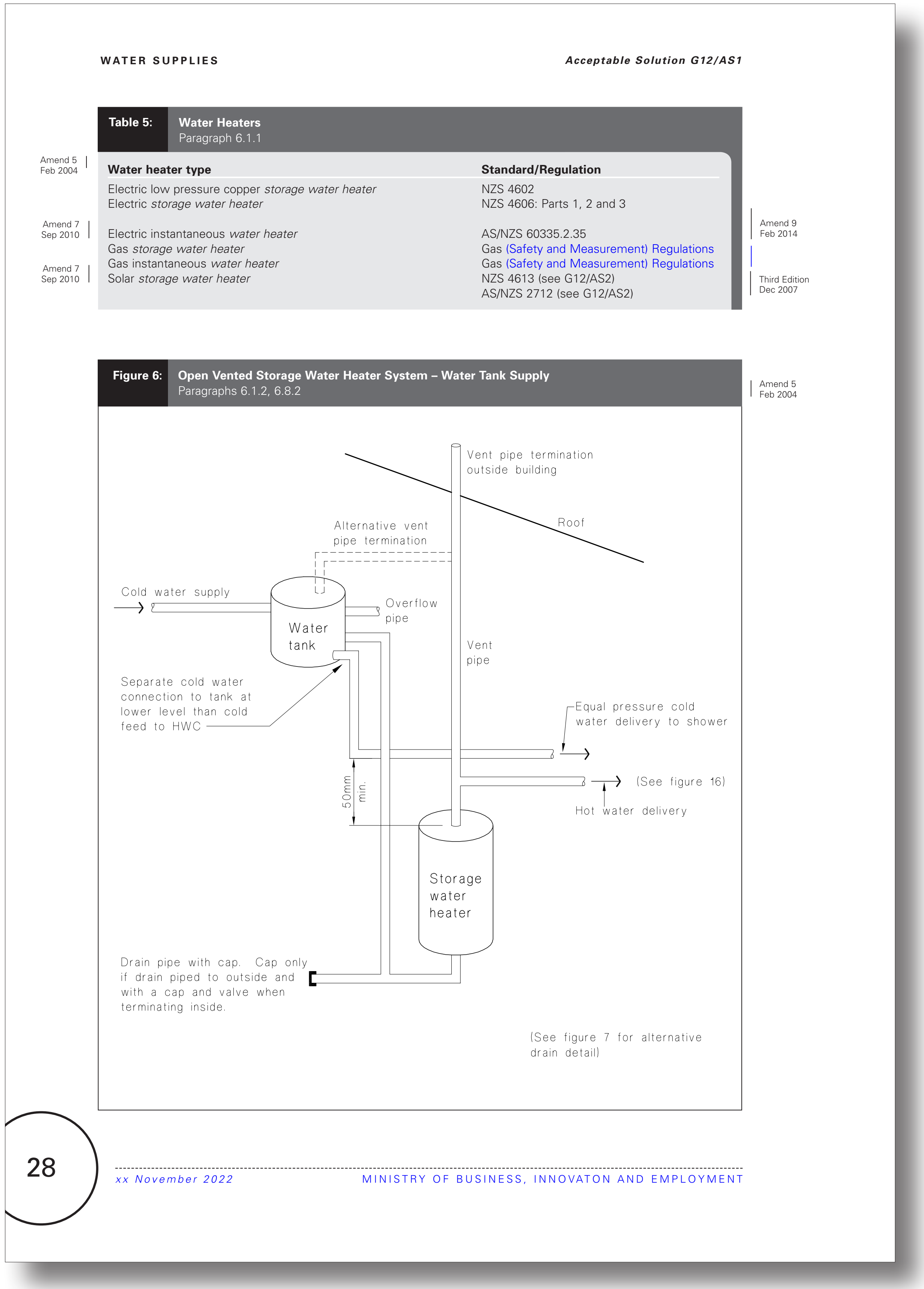
1 December 2007 | DEPARTMENT OF BUILDING AND HOUSING

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



WATER SUPPLIES | *Acceptable Solution G12/AS1*

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Paragraph 6.1.1

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Electric instantaneous *water heater*	AS/NZS 60335.2.35
Gas *storage water heater*	Gas (Safety and Measurement) Regulations
Gas instantaneous *water heater*	Gas (Safety and Measurement) Regulations
Solar *storage water heater*	NZS 4613 (see G12/AS2) AS/NZS 2712 (see G12/AS2)

Amend 5
Feb 2004

Amend 7
Sep 2010

Amend 7
Sep 2010

Amend 9
Feb 2014

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Figure 6: **Open Vented Storage Water Heater System – Water Tank Supply**
Paragraphs 6.1.2, 6.8.2

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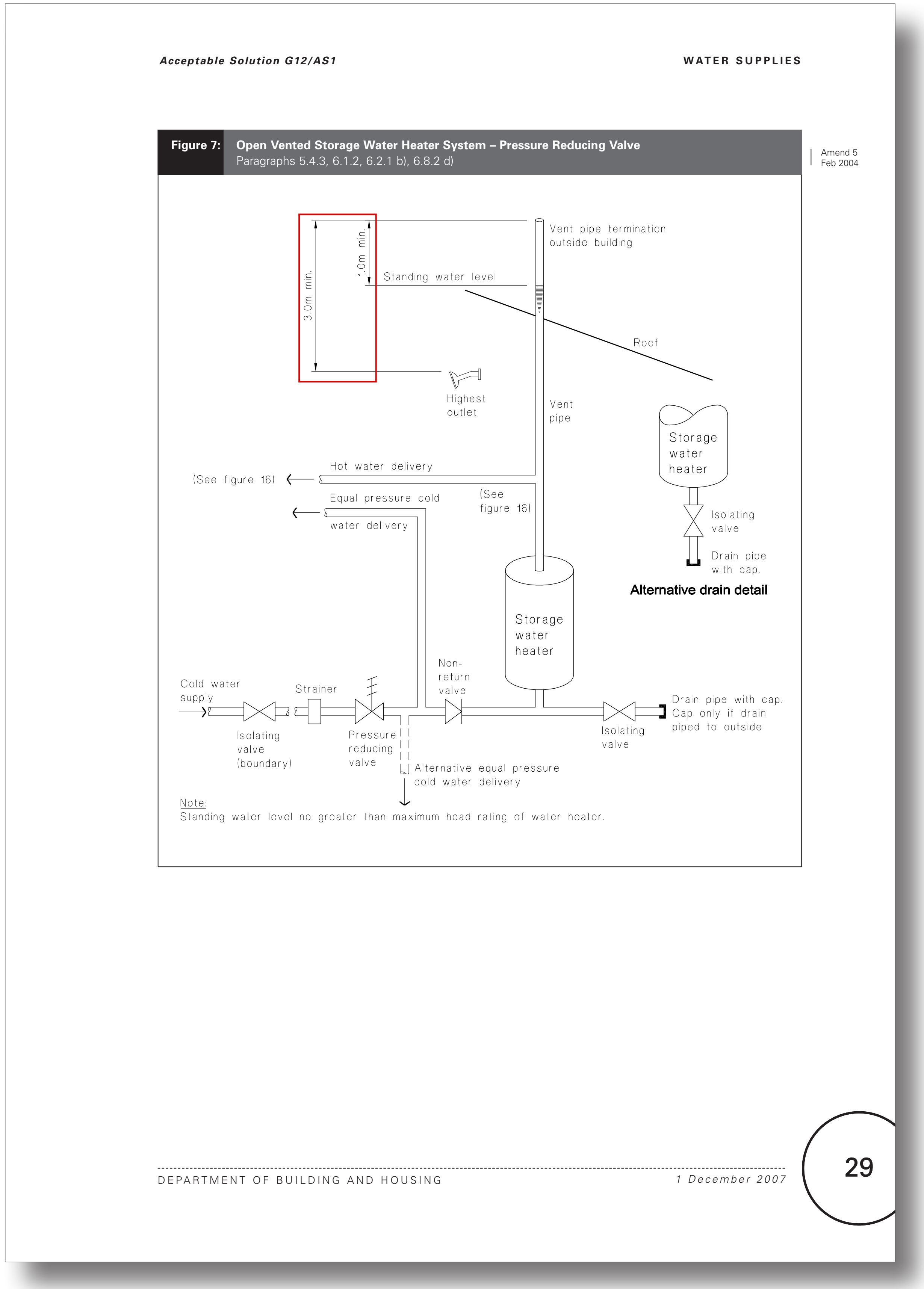

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Figure 7: **Open Vented Storage Water Heater System – Pressure Reducing Valve**
Paragraphs 5.4.3, 6.1.2, 6.2.1 b), 6.8.2 d)

Amend 5 Feb 2004

Note:
Standing water level no greater than maximum head rating of water heater.

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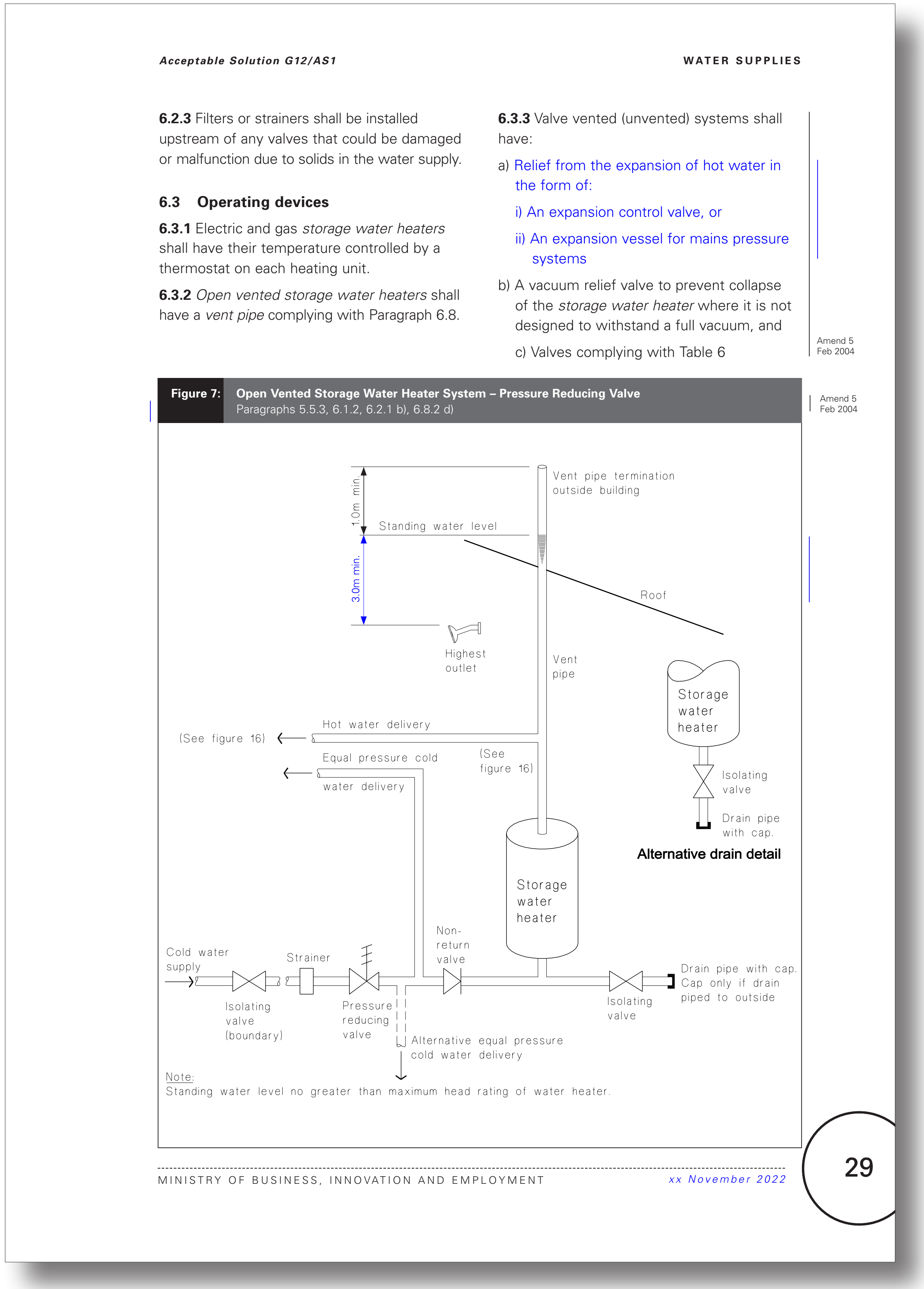

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6.2.3 Filters or strainers shall be installed upstream of any valves that could be damaged or malfunction due to solids in the water supply.

6.3 Operating devices

6.3.1 Electric and gas *storage water heaters* shall have their temperature controlled by a thermostat on each heating unit.

6.3.2 *Open vented storage water heaters* shall have a *vent pipe* complying with Paragraph 6.8.

6.3.3 Valve vented (unvented) systems shall have:

a) Relief from the expansion of hot water in the form of:
  i) An expansion control valve, or
  ii) An expansion vessel for mains pressure systems

b) A vacuum relief valve to prevent collapse of the *storage water heater* where it is not designed to withstand a full vacuum, and

c) Valves complying with Table 6

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Figure 7: **Open Vented Storage Water Heater System – Pressure Reducing Valve**
Paragraphs 5.5.3, 6.1.2, 6.2.1 b), 6.8.2 d)

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Note:
Standing water level no greater than maximum head rating of water heater.

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Figure 8: Mains Pressure Storage Water Heater System (unvented)
Paragraphs 6.1.2 and 6.2.1 b)

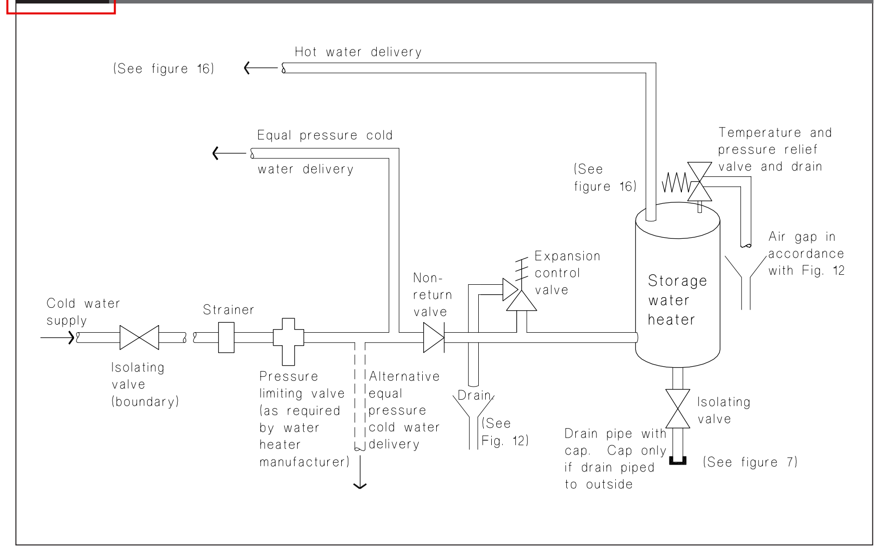
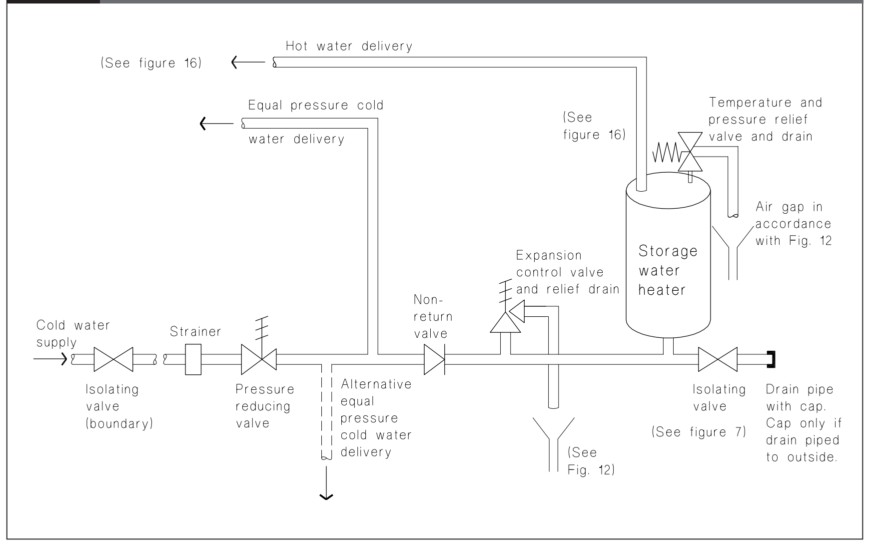


Figure 9: Low Pressure Valve – Vented Water Heater System – Temperature and Pressure Relief Valve
Paragraphs 6.1.2 and 6.2.1 b)



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Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)

WATER SUPPLIES

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Figure 8 (a): Mains Pressure Storage Water Heater System (unvented)
Paragraphs 6.1.2 and 6.2.1 c)

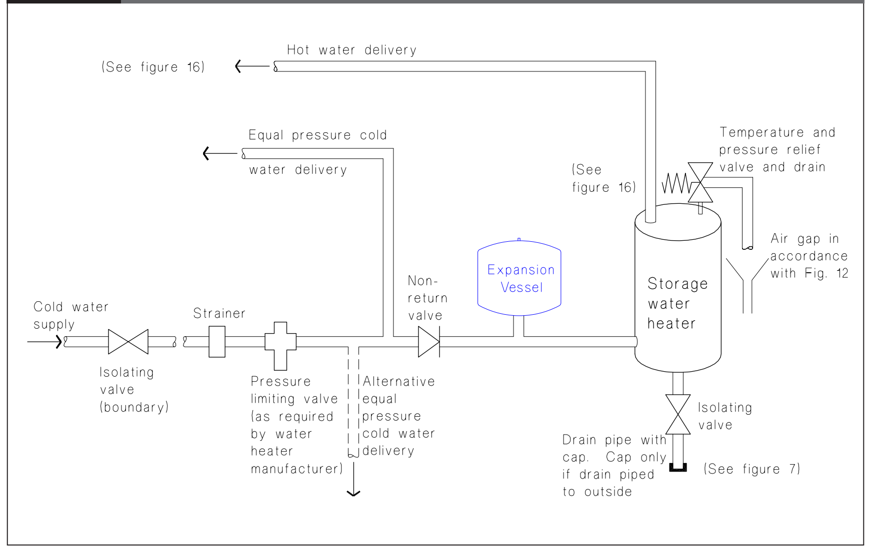

Figure 8 (b): Mains Pressure Storage Water Heater System (unvented)
Paragraphs 6.1.2 and 6.2.1 c)

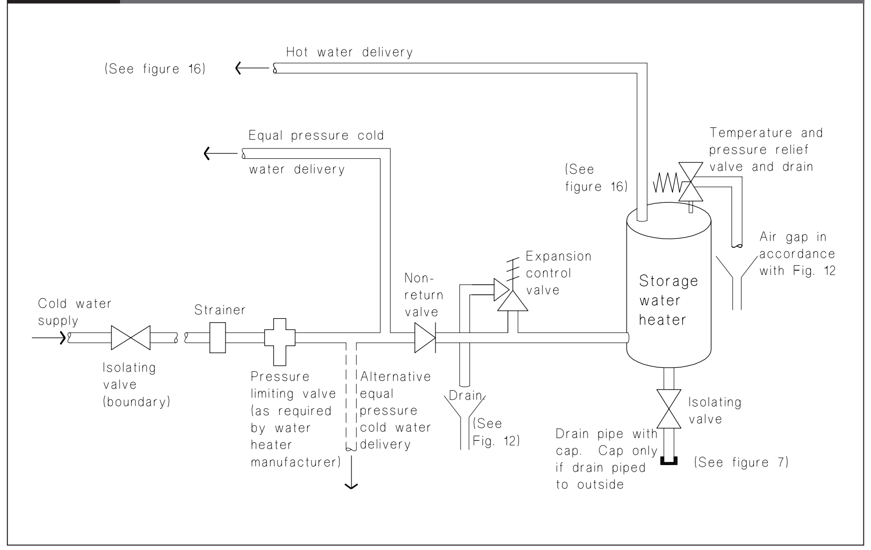

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Figure 10: **Low Pressure Valve – Vented Storage Water Heater System – Pressure Relief Valve**
Paragraphs 6.1.2 and 6.2.1 b)

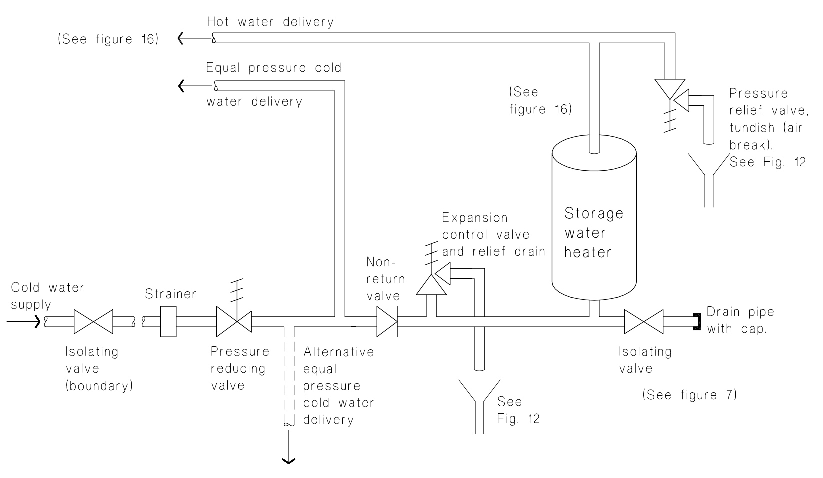
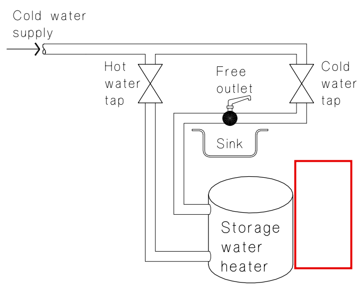


Figure 11: **Free Outlet System (push through)**
Paragraph 6.1.2



Note: Only free outlets to be used for hot water. i.e. outlets that are not restricted and cannot be shut off.

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)

Figure 9: **Low Pressure Valve – Vented Water Heater System – Temperature and Pressure Relief Valve**
Paragraphs 6.1.2 and 6.2.1 b)

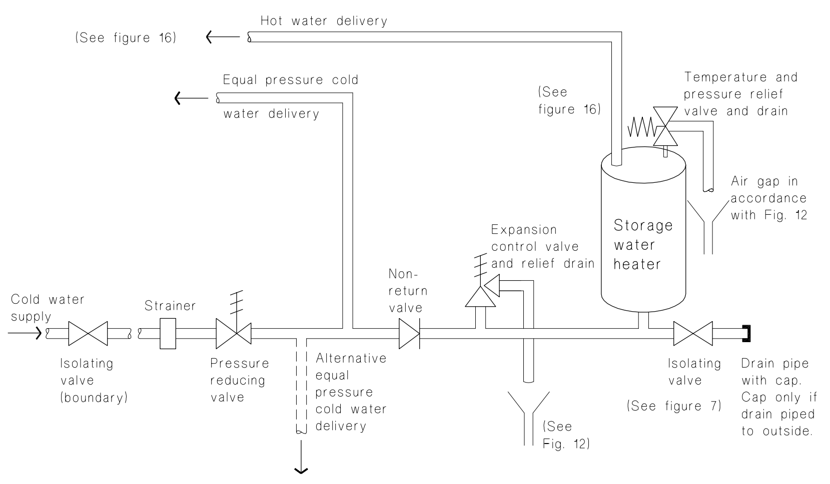
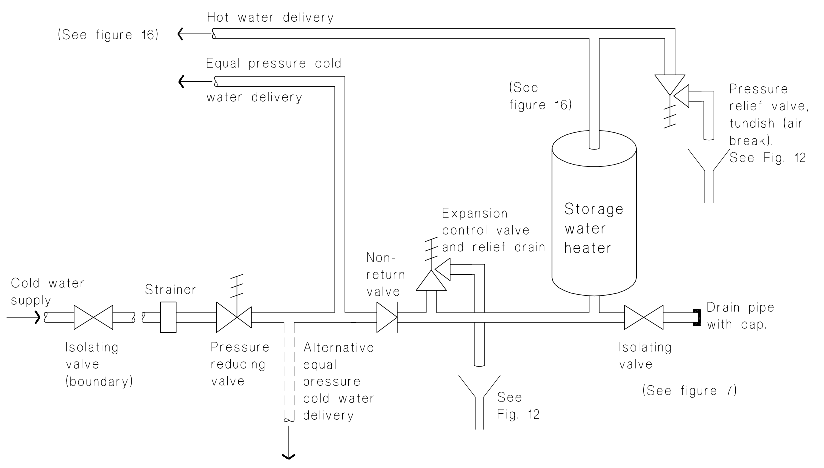


Figure 10: **Low Pressure Valve – Vented Storage Water Heater System – Pressure Relief Valve**
Paragraphs 6.1.2 and 6.2.1 b)



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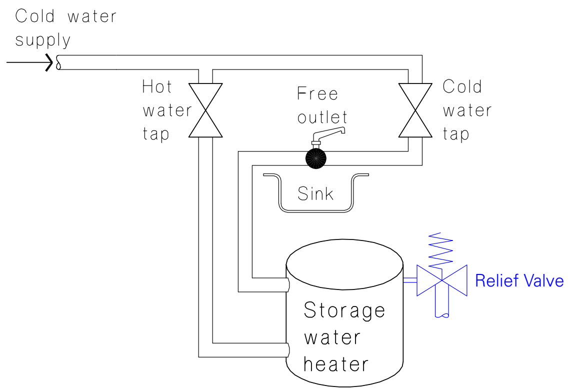
Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)

WATER SUPPLIES *Acceptable Solution G12/AS1*

Figure 11: **Free Outlet System (push through)**
Paragraph 6.1.2



Note: Only free outlets to be used for hot water. i.e. outlets that are not restricted and cannot be shut off.

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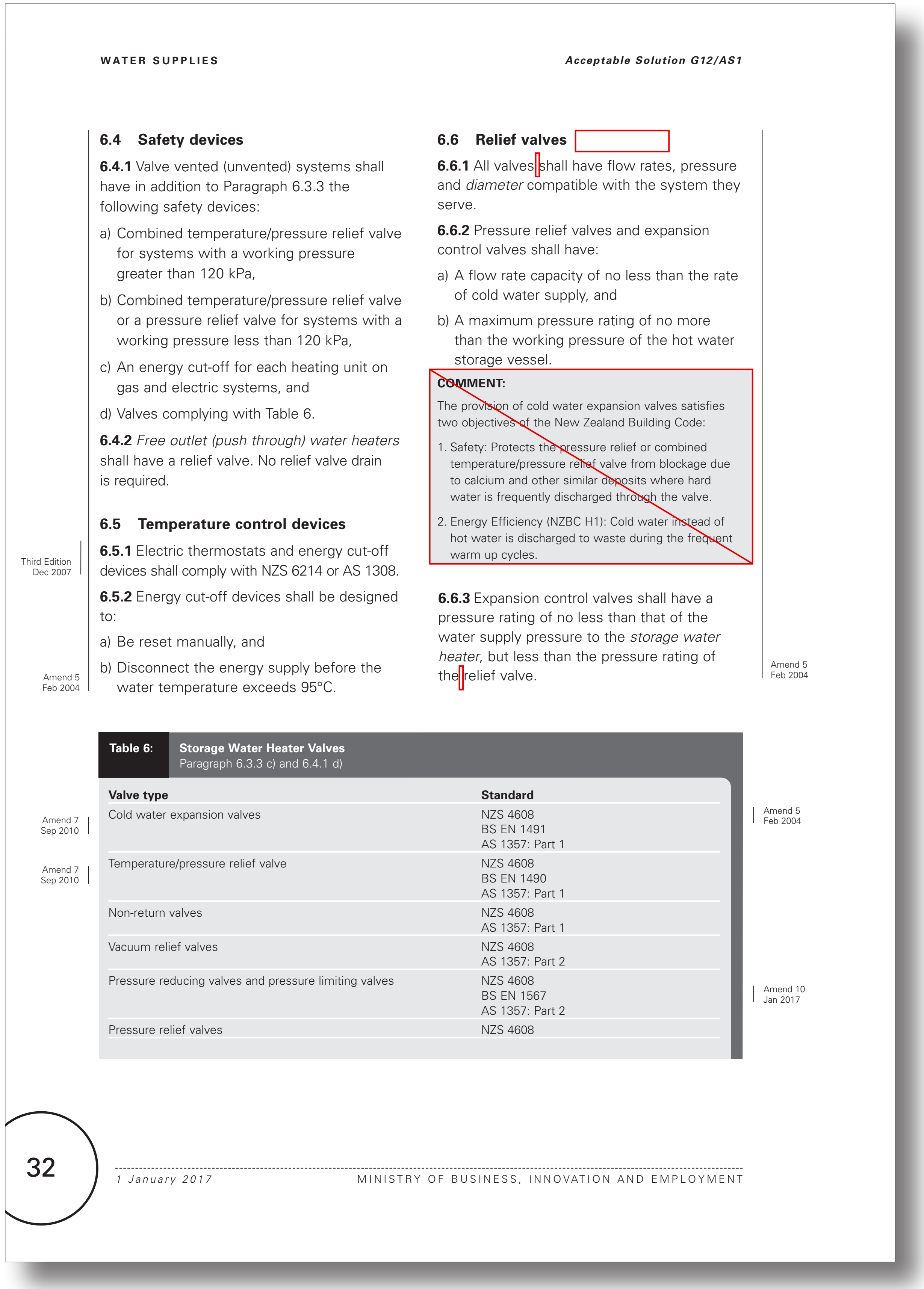
Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



WATER SUPPLIES

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6.4 Safety devices

6.4.1 Valve vented (unvented) systems shall have in addition to Paragraph 6.3.3 the following safety devices:

a) Combined temperature/pressure relief valve for systems with a working pressure greater than 120 kPa,

b) Combined temperature/pressure relief valve or a pressure relief valve for systems with a working pressure less than 120 kPa,

c) An energy cut-off for each heating unit on gas and electric systems, and

d) Valves complying with Table 6.

6.4.2 *Free outlet (push through) water heaters* shall have a relief valve. No relief valve drain is required.

6.5 Temperature control devices

Third Edition
Dec 2007

6.5.1 Electric thermostats and energy cut-off devices shall comply with NZS 6214 or AS 1308.

6.5.2 Energy cut-off devices shall be designed to:

a) Be reset manually, and

b) Disconnect the energy supply before the water temperature exceeds 95°C.

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6.6 Relief valves

6.6.1 All valves shall have flow rates, pressure and *diameter* compatible with the system they serve.

6.6.2 Pressure relief valves and expansion control valves shall have:

a) A flow rate capacity of no less than the rate of cold water supply, and

b) A maximum pressure rating of no more than the working pressure of the hot water storage vessel.

~~**COMMENT:**~~

~~The provision of cold water expansion valves satisfies two objectives of the New Zealand Building Code:~~

~~1. Safety: Protects the pressure relief or combined temperature/pressure relief valve from blockage due to calcium and other similar deposits where hard water is frequently discharged through the valve.~~

~~2. Energy Efficiency (NZBC H1): Cold water instead of hot water is discharged to waste during the frequent warm up cycles.~~

6.6.3 Expansion control valves shall have a pressure rating of no less than that of the water supply pressure to the *storage water heater*, but less than the pressure rating of the relief valve.

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Table 6: Storage Water Heater Valves
Paragraph 6.3.3 c) and 6.4.1 d)

Valve type	Standard
Cold water expansion valves	NZS 4608 BS EN 1491 AS 1357: Part 1
Temperature/pressure relief valve	NZS 4608 BS EN 1490 AS 1357: Part 1
Non-return valves	NZS 4608 AS 1357: Part 1
Vacuum relief valves	NZS 4608 AS 1357: Part 2
Pressure reducing valves and pressure limiting valves	NZS 4608 BS EN 1567 AS 1357: Part 2
Pressure relief valves	NZS 4608

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Proposed amendments to G12 Water Supplies acceptable solutions and verification methods

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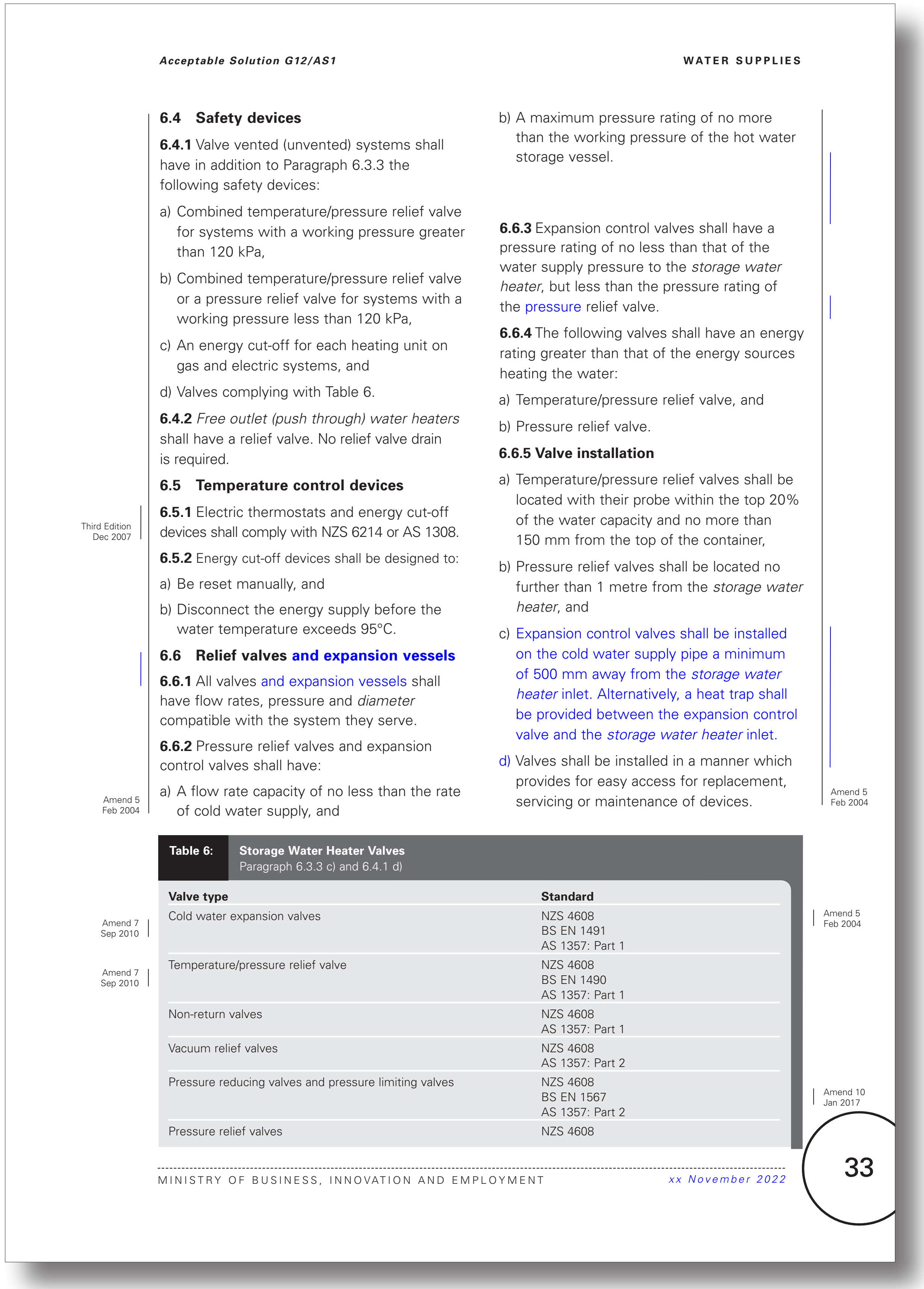

Acceptable Solution G12/AS1

WATER SUPPLIES

6.4 Safety devices

6.4.1 Valve vented (unvented) systems shall have in addition to Paragraph 6.3.3 the following safety devices:

a) Combined temperature/pressure relief valve for systems with a working pressure greater than 120 kPa,

b) Combined temperature/pressure relief valve or a pressure relief valve for systems with a working pressure less than 120 kPa,

c) An energy cut-off for each heating unit on gas and electric systems, and

d) Valves complying with Table 6.

6.4.2 *Free outlet (push through) water heaters* shall have a relief valve. No relief valve drain is required.

6.5 Temperature control devices

Third Edition
Dec 2007

6.5.1 Electric thermostats and energy cut-off devices shall comply with NZS 6214 or AS 1308.

6.5.2 Energy cut-off devices shall be designed to:

a) Be reset manually, and

b) Disconnect the energy supply before the water temperature exceeds 95°C.

6.6 Relief valves and expansion vessels

6.6.1 All valves and expansion vessels shall have flow rates, pressure and *diameter* compatible with the system they serve.

6.6.2 Pressure relief valves and expansion control valves shall have:

a) A flow rate capacity of no less than the rate of cold water supply, and

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b) A maximum pressure rating of no more than the working pressure of the hot water storage vessel.

6.6.3 Expansion control valves shall have a pressure rating of no less than that of the water supply pressure to the *storage water heater*, but less than the pressure rating of the pressure relief valve.

6.6.4 The following valves shall have an energy rating greater than that of the energy sources heating the water:

a) Temperature/pressure relief valve, and

b) Pressure relief valve.

6.6.5 Valve installation

a) Temperature/pressure relief valves shall be located with their probe within the top 20% of the water capacity and no more than 150 mm from the top of the container,

b) Pressure relief valves shall be located no further than 1 metre from the *storage water heater*, and

c) Expansion control valves shall be installed on the cold water supply pipe a minimum of 500 mm away from the *storage water heater* inlet. Alternatively, a heat trap shall be provided between the expansion control valve and the *storage water heater* inlet.

d) Valves shall be installed in a manner which provides for easy access for replacement, servicing or maintenance of devices.

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Table 6: Storage Water Heater Valves
Paragraph 6.3.3 c) and 6.4.1 d)

Valve type	Standard
Cold water expansion valves	NZS 4608 BS EN 1491 AS 1357: Part 1
Temperature/pressure relief valve	NZS 4608 BS EN 1490 AS 1357: Part 1
Non-return valves	NZS 4608 AS 1357: Part 1
Vacuum relief valves	NZS 4608 AS 1357: Part 2
Pressure reducing valves and pressure limiting valves	NZS 4608 BS EN 1567 AS 1357: Part 2
Pressure relief valves	NZS 4608

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Proposed amendments to G12 Water Supplies acceptable solutions and verification methods

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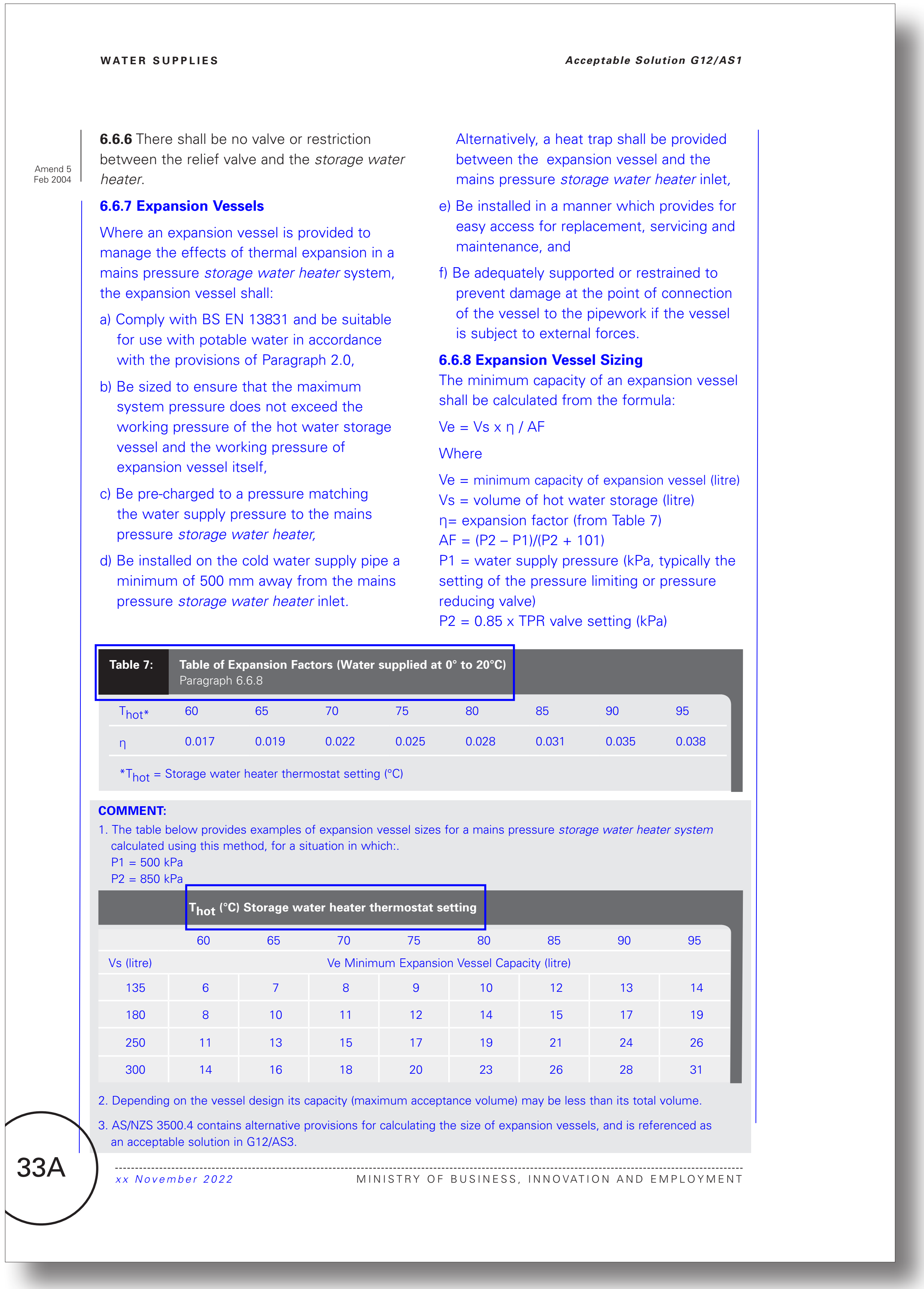

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6.6.6 There shall be no valve or restriction between the relief valve and the *storage water heater.*

6.6.7 Expansion Vessels

Where an expansion vessel is provided to manage the effects of thermal expansion in a mains pressure *storage water heater* system, the expansion vessel shall:

a) Comply with BS EN 13831 and be suitable for use with potable water in accordance with the provisions of Paragraph 2.0,

b) Be sized to ensure that the maximum system pressure does not exceed the working pressure of the hot water storage vessel and the working pressure of expansion vessel itself,

c) Be pre-charged to a pressure matching the water supply pressure to the mains pressure *storage water heater,*

d) Be installed on the cold water supply pipe a minimum of 500 mm away from the mains pressure *storage water heater* inlet. Alternatively, a heat trap shall be provided between the expansion vessel and the mains pressure *storage water heater* inlet,

e) Be installed in a manner which provides for easy access for replacement, servicing and maintenance, and

f) Be adequately supported or restrained to prevent damage at the point of connection of the vessel to the pipework if the vessel is subject to external forces.

6.6.8 Expansion Vessel Sizing

The minimum capacity of an expansion vessel shall be calculated from the formula:

$Ve = Vs \times \eta / AF$

Where

Ve = minimum capacity of expansion vessel (litre)
Vs = volume of hot water storage (litre)
η= expansion factor (from Table 7)
AF = (P2 – P1)/(P2 + 101)
P1 = water supply pressure (kPa, typically the setting of the pressure limiting or pressure reducing valve)
P2 = 0.85 x TPR valve setting (kPa)

Table 7: Table of Expansion Factors (Water supplied at 0° to 20°C)
Paragraph 6.6.8

T_{hot}*	60	65	70	75	80	85	90	95
η	0.017	0.019	0.022	0.025	0.028	0.031	0.035	0.038

*T_{hot} = Storage water heater thermostat setting (°C)

COMMENT:

1. The table below provides examples of expansion vessel sizes for a mains pressure *storage water heater system* calculated using this method, for a situation in which:.
   P1 = 500 kPa
   P2 = 850 kPa

	T_{hot} (°C) Storage water heater thermostat setting							
	60	65	70	75	80	85	90	95
Vs (litre)	Ve Minimum Expansion Vessel Capacity (litre)							
135	6	7	8	9	10	12	13	14
180	8	10	11	12	14	15	17	19
250	11	13	15	17	19	21	24	26
300	14	16	18	20	23	26	28	31

2. Depending on the vessel design its capacity (maximum acceptance volume) may be less than its total volume.

3. AS/NZS 3500.4 contains alternative provisions for calculating the size of expansion vessels, and is referenced as an acceptable solution in G12/AS3.

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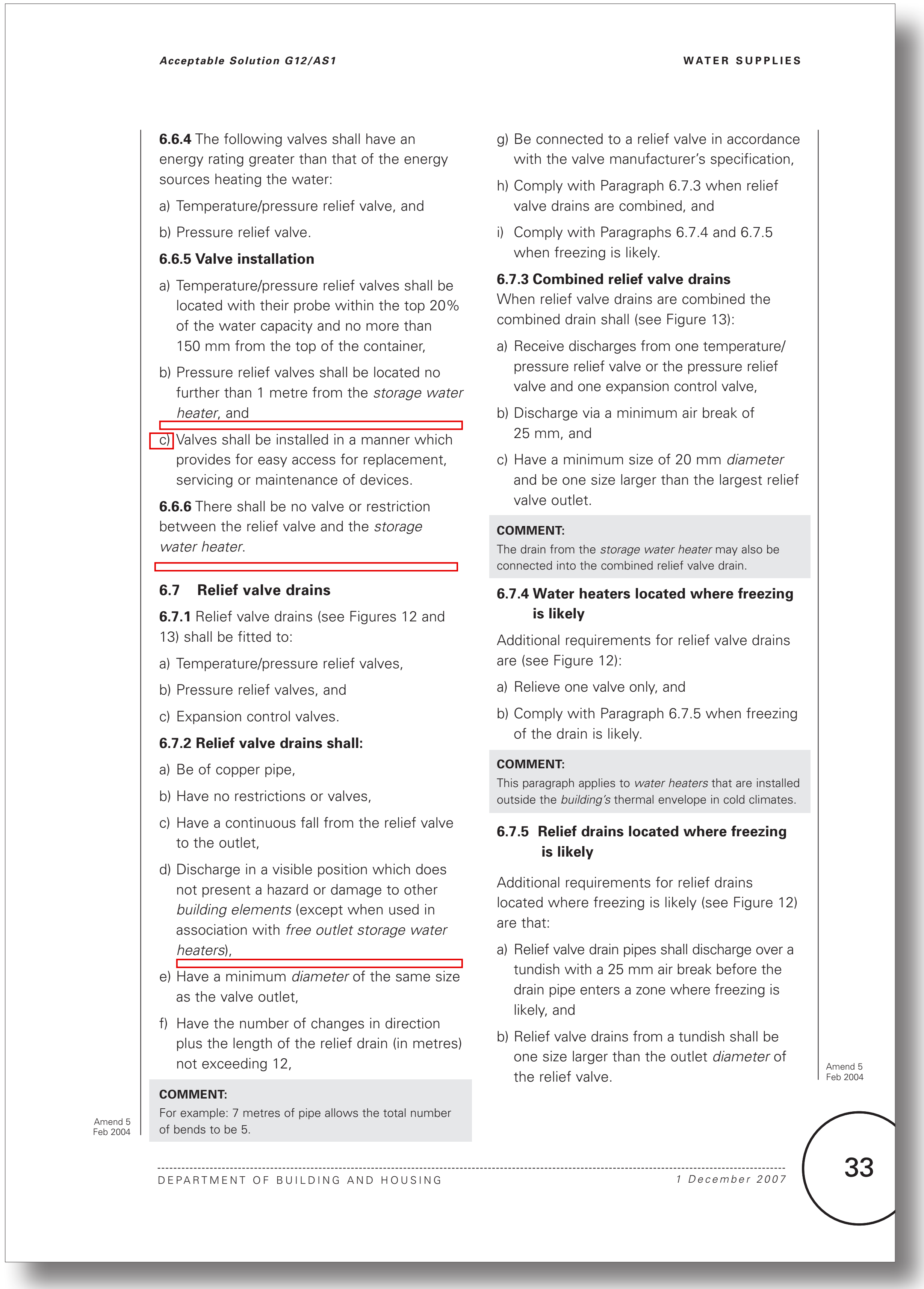

6.6.4 The following valves shall have an energy rating greater than that of the energy sources heating the water:

a) Temperature/pressure relief valve, and

b) Pressure relief valve.

6.6.5 Valve installation

a) Temperature/pressure relief valves shall be located with their probe within the top 20% of the water capacity and no more than 150 mm from the top of the container,

b) Pressure relief valves shall be located no further than 1 metre from the *storage water heater*, and

c) Valves shall be installed in a manner which provides for easy access for replacement, servicing or maintenance of devices.

6.6.6 There shall be no valve or restriction between the relief valve and the *storage water heater*.

6.7 Relief valve drains

6.7.1 Relief valve drains (see Figures 12 and 13) shall be fitted to:

a) Temperature/pressure relief valves,

b) Pressure relief valves, and

c) Expansion control valves.

6.7.2 Relief valve drains shall:

a) Be of copper pipe,

b) Have no restrictions or valves,

c) Have a continuous fall from the relief valve to the outlet,

d) Discharge in a visible position which does not present a hazard or damage to other *building elements* (except when used in association with *free outlet storage water heaters*),

e) Have a minimum *diameter* of the same size as the valve outlet,

f) Have the number of changes in direction plus the length of the relief drain (in metres) not exceeding 12,

COMMENT:
For example: 7 metres of pipe allows the total number of bends to be 5.

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g) Be connected to a relief valve in accordance with the valve manufacturer's specification,

h) Comply with Paragraph 6.7.3 when relief valve drains are combined, and

i) Comply with Paragraphs 6.7.4 and 6.7.5 when freezing is likely.

6.7.3 Combined relief valve drains
When relief valve drains are combined the combined drain shall (see Figure 13):

a) Receive discharges from one temperature/pressure relief valve or the pressure relief valve and one expansion control valve,

b) Discharge via a minimum air break of 25 mm, and

c) Have a minimum size of 20 mm *diameter* and be one size larger than the largest relief valve outlet.

COMMENT:
The drain from the *storage water heater* may also be connected into the combined relief valve drain.

6.7.4 Water heaters located where freezing is likely

Additional requirements for relief valve drains are (see Figure 12):

a) Relieve one valve only, and

b) Comply with Paragraph 6.7.5 when freezing of the drain is likely.

COMMENT:
This paragraph applies to *water heaters* that are installed outside the *building's* thermal envelope in cold climates.

6.7.5 Relief drains located where freezing is likely

Additional requirements for relief drains located where freezing is likely (see Figure 12) are that:

a) Relief valve drain pipes shall discharge over a tundish with a 25 mm air break before the drain pipe enters a zone where freezing is likely, and

b) Relief valve drains from a tundish shall be one size larger than the outlet *diameter* of the relief valve.

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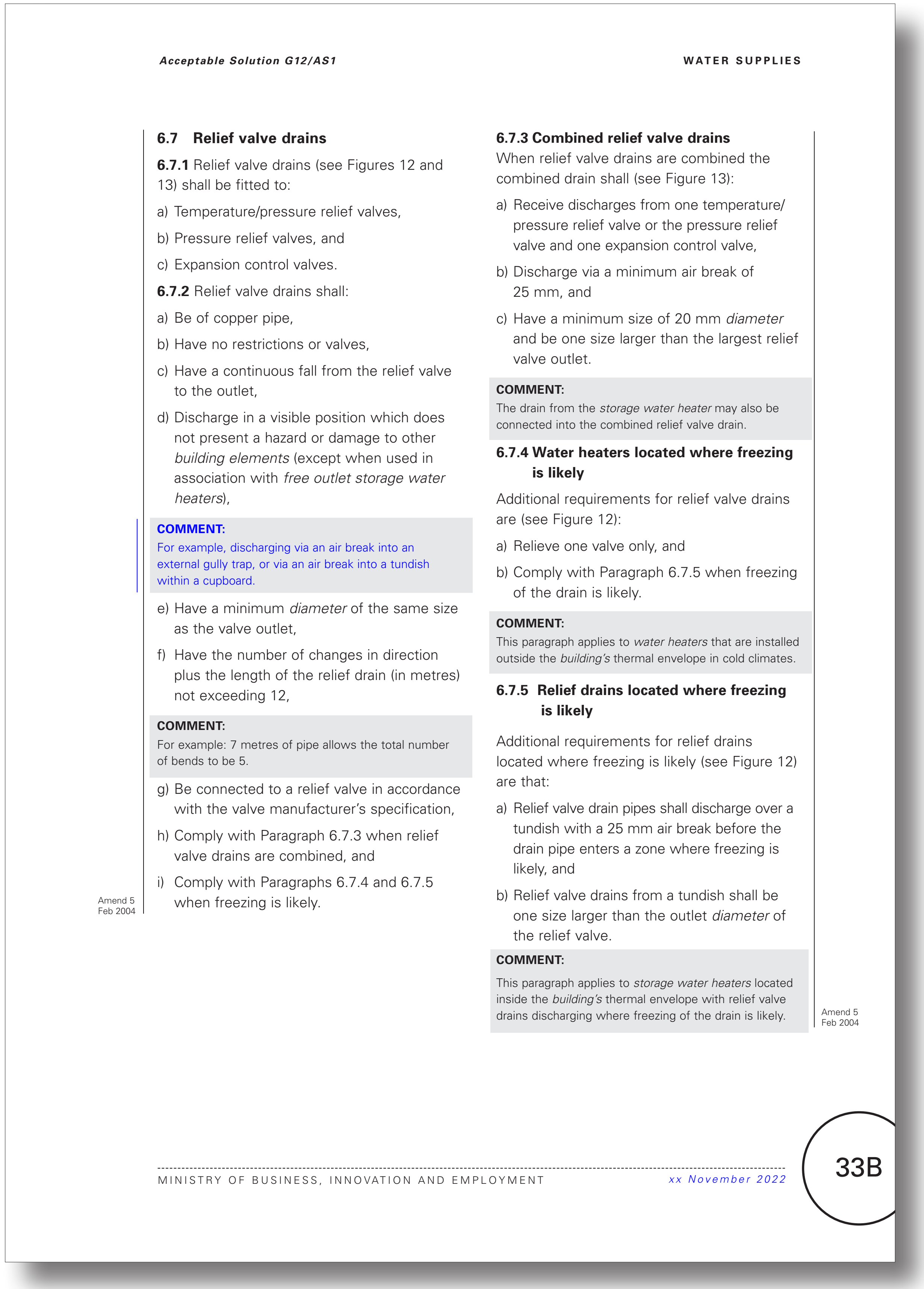

6.7 Relief valve drains

6.7.1 Relief valve drains (see Figures 12 and 13) shall be fitted to:

a) Temperature/pressure relief valves,

b) Pressure relief valves, and

c) Expansion control valves.

6.7.2 Relief valve drains shall:

a) Be of copper pipe,

b) Have no restrictions or valves,

c) Have a continuous fall from the relief valve to the outlet,

d) Discharge in a visible position which does not present a hazard or damage to other *building elements* (except when used in association with *free outlet storage water heaters*),

COMMENT:
For example, discharging via an air break into an external gully trap, or via an air break into a tundish within a cupboard.

e) Have a minimum *diameter* of the same size as the valve outlet,

f) Have the number of changes in direction plus the length of the relief drain (in metres) not exceeding 12,

COMMENT:
For example: 7 metres of pipe allows the total number of bends to be 5.

g) Be connected to a relief valve in accordance with the valve manufacturer's specification,

h) Comply with Paragraph 6.7.3 when relief valve drains are combined, and

i) Comply with Paragraphs 6.7.4 and 6.7.5 when freezing is likely.

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6.7.3 Combined relief valve drains
When relief valve drains are combined the combined drain shall (see Figure 13):

a) Receive discharges from one temperature/pressure relief valve or the pressure relief valve and one expansion control valve,

b) Discharge via a minimum air break of 25 mm, and

c) Have a minimum size of 20 mm *diameter* and be one size larger than the largest relief valve outlet.

COMMENT:
The drain from the *storage water heater* may also be connected into the combined relief valve drain.

6.7.4 Water heaters located where freezing is likely

Additional requirements for relief valve drains are (see Figure 12):

a) Relieve one valve only, and

b) Comply with Paragraph 6.7.5 when freezing of the drain is likely.

COMMENT:
This paragraph applies to *water heaters* that are installed outside the *building's* thermal envelope in cold climates.

6.7.5 Relief drains located where freezing is likely

Additional requirements for relief drains located where freezing is likely (see Figure 12) are that:

a) Relief valve drain pipes shall discharge over a tundish with a 25 mm air break before the drain pipe enters a zone where freezing is likely, and

b) Relief valve drains from a tundish shall be one size larger than the outlet *diameter* of the relief valve.

COMMENT:
This paragraph applies to *storage water heaters* located inside the *building's* thermal envelope with relief valve drains discharging where freezing of the drain is likely.

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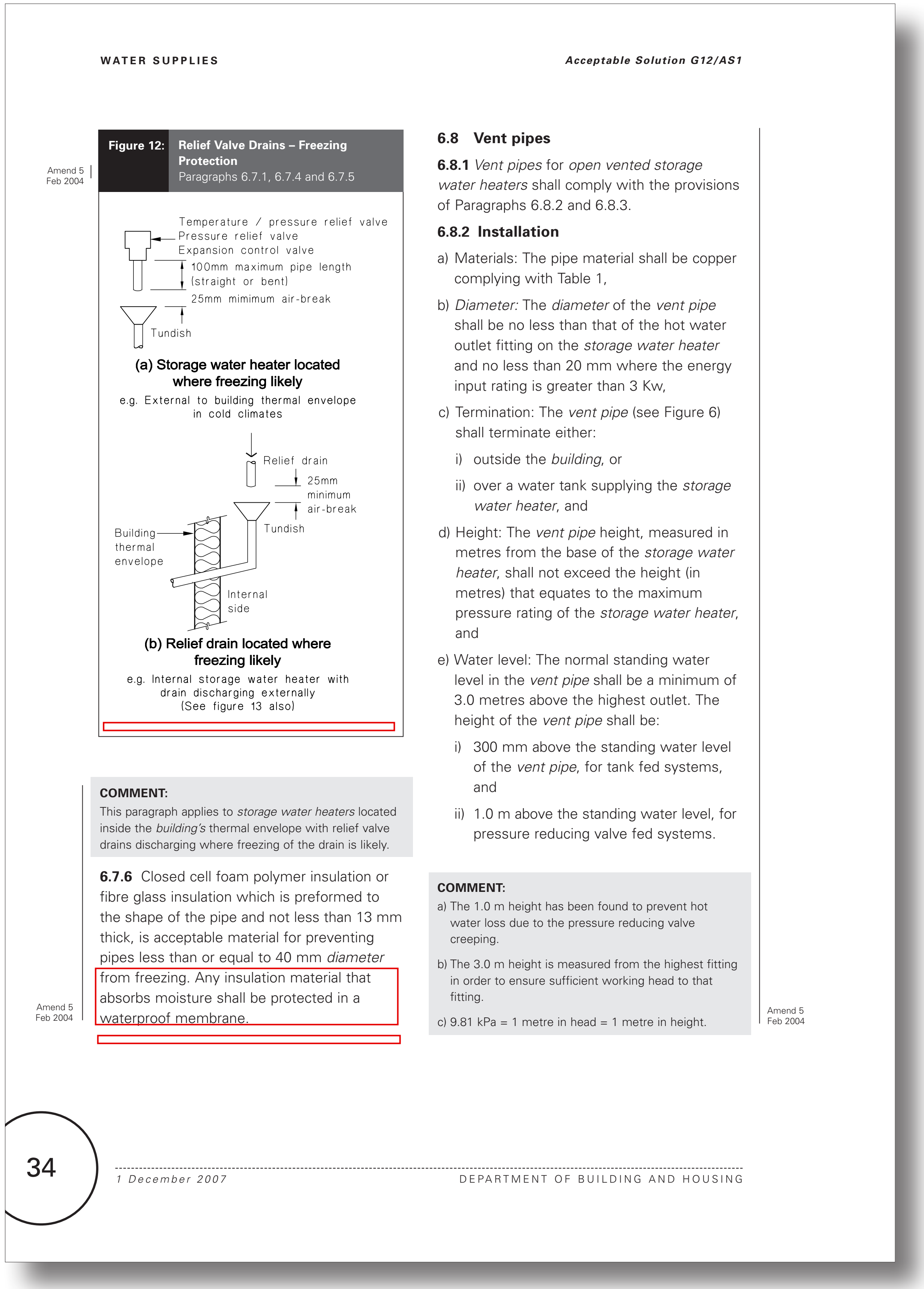

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Figure 12: **Relief Valve Drains – Freezing Protection**
Paragraphs 6.7.1, 6.7.4 and 6.7.5

(a) Storage water heater located where freezing likely

e.g. External to building thermal envelope in cold climates

(b) Relief drain located where freezing likely

e.g. Internal storage water heater with drain discharging externally (See figure 13 also)

COMMENT:
This paragraph applies to *storage water heaters* located inside the *building's* thermal envelope with relief valve drains discharging where freezing of the drain is likely.

6.7.6 Closed cell foam polymer insulation or fibre glass insulation which is preformed to the shape of the pipe and not less than 13 mm thick, is acceptable material for preventing pipes less than or equal to 40 mm *diameter* from freezing. Any insulation material that absorbs moisture shall be protected in a waterproof membrane.

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6.8 Vent pipes

6.8.1 *Vent pipes* for *open vented storage water heaters* shall comply with the provisions of Paragraphs 6.8.2 and 6.8.3.

6.8.2 Installation

a) Materials: The pipe material shall be copper complying with Table 1,

b) *Diameter:* The *diameter* of the *vent pipe* shall be no less than that of the hot water outlet fitting on the *storage water heater* and no less than 20 mm where the energy input rating is greater than 3 Kw,

c) Termination: The *vent pipe* (see Figure 6) shall terminate either:

i) outside the *building*, or

ii) over a water tank supplying the *storage water heater*, and

d) Height: The *vent pipe* height, measured in metres from the base of the *storage water heater*, shall not exceed the height (in metres) that equates to the maximum pressure rating of the *storage water heater*, and

e) Water level: The normal standing water level in the *vent pipe* shall be a minimum of 3.0 metres above the highest outlet. The height of the *vent pipe* shall be:

i) 300 mm above the standing water level of the *vent pipe*, for tank fed systems, and

ii) 1.0 m above the standing water level, for pressure reducing valve fed systems.

COMMENT:
a) The 1.0 m height has been found to prevent hot water loss due to the pressure reducing valve creeping.
b) The 3.0 m height is measured from the highest fitting in order to ensure sufficient working head to that fitting.
c) 9.81 kPa = 1 metre in head = 1 metre in height.

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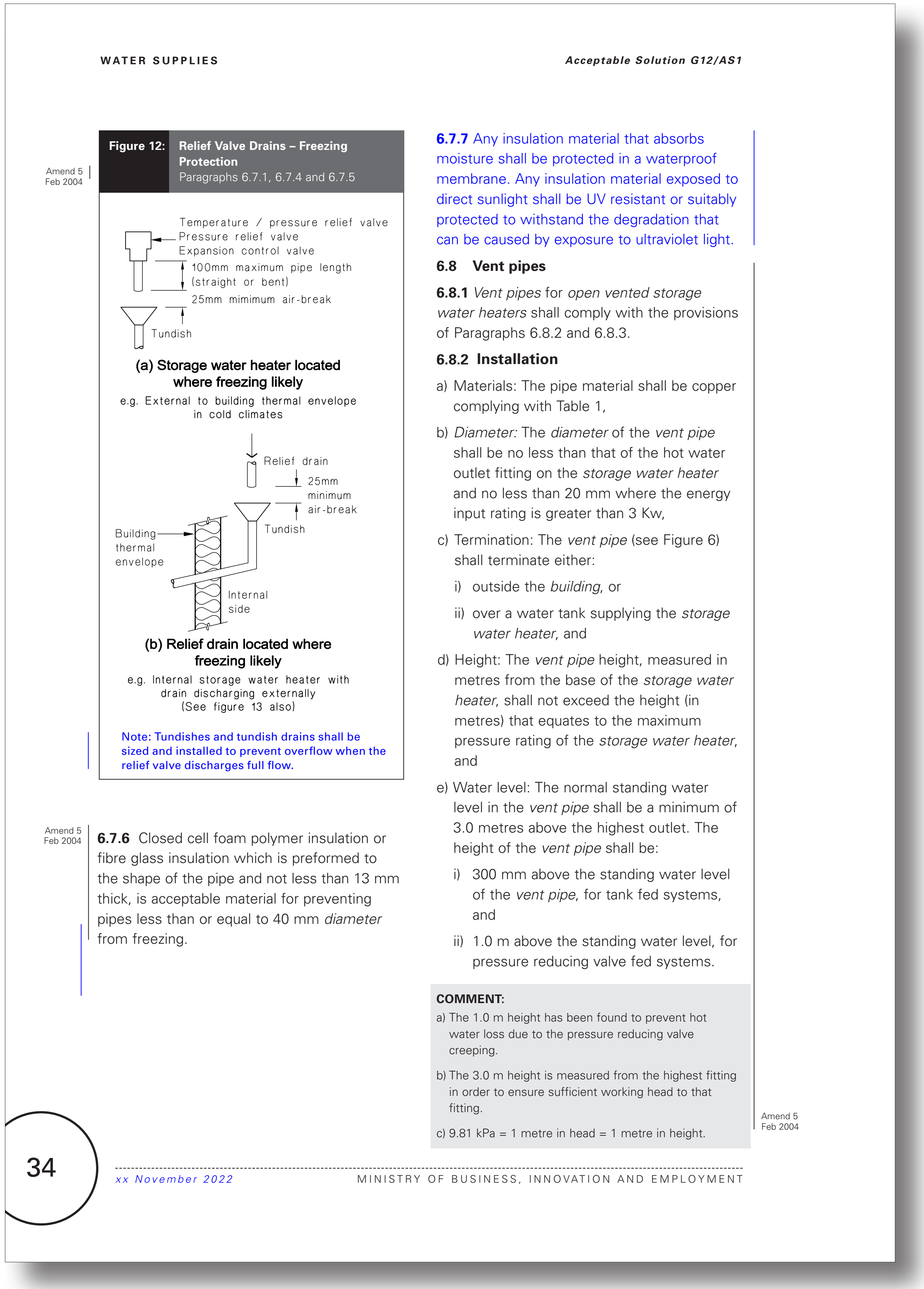
1 December 2007 DEPARTMENT OF BUILDING AND HOUSING

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



WATER SUPPLIES

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Figure 12: **Relief Valve Drains – Freezing Protection**
Paragraphs 6.7.1, 6.7.4 and 6.7.5

(a) Storage water heater located where freezing likely

e.g. External to building thermal envelope in cold climates

(b) Relief drain located where freezing likely

e.g. Internal storage water heater with drain discharging externally (See figure 13 also)

Note: Tundishes and tundish drains shall be sized and installed to prevent overflow when the relief valve discharges full flow.

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6.7.6 Closed cell foam polymer insulation or fibre glass insulation which is preformed to the shape of the pipe and not less than 13 mm thick, is acceptable material for preventing pipes less than or equal to 40 mm *diameter* from freezing.

6.7.7 Any insulation material that absorbs moisture shall be protected in a waterproof membrane. Any insulation material exposed to direct sunlight shall be UV resistant or suitably protected to withstand the degradation that can be caused by exposure to ultraviolet light.

6.8 Vent pipes

6.8.1 *Vent pipes* for *open vented storage water heaters* shall comply with the provisions of Paragraphs 6.8.2 and 6.8.3.

6.8.2 Installation

a) Materials: The pipe material shall be copper complying with Table 1,

b) *Diameter:* The *diameter* of the *vent pipe* shall be no less than that of the hot water outlet fitting on the *storage water heater* and no less than 20 mm where the energy input rating is greater than 3 Kw,

c) Termination: The *vent pipe* (see Figure 6) shall terminate either:

i) outside the *building*, or

ii) over a water tank supplying the *storage water heater*, and

d) Height: The *vent pipe* height, measured in metres from the base of the *storage water heater*, shall not exceed the height (in metres) that equates to the maximum pressure rating of the *storage water heater*, and

e) Water level: The normal standing water level in the *vent pipe* shall be a minimum of 3.0 metres above the highest outlet. The height of the *vent pipe* shall be:

i) 300 mm above the standing water level of the *vent pipe*, for tank fed systems, and

ii) 1.0 m above the standing water level, for pressure reducing valve fed systems.

COMMENT:
a) The 1.0 m height has been found to prevent hot water loss due to the pressure reducing valve creeping.
b) The 3.0 m height is measured from the highest fitting in order to ensure sufficient working head to that fitting.
c) 9.81 kPa = 1 metre in head = 1 metre in height.

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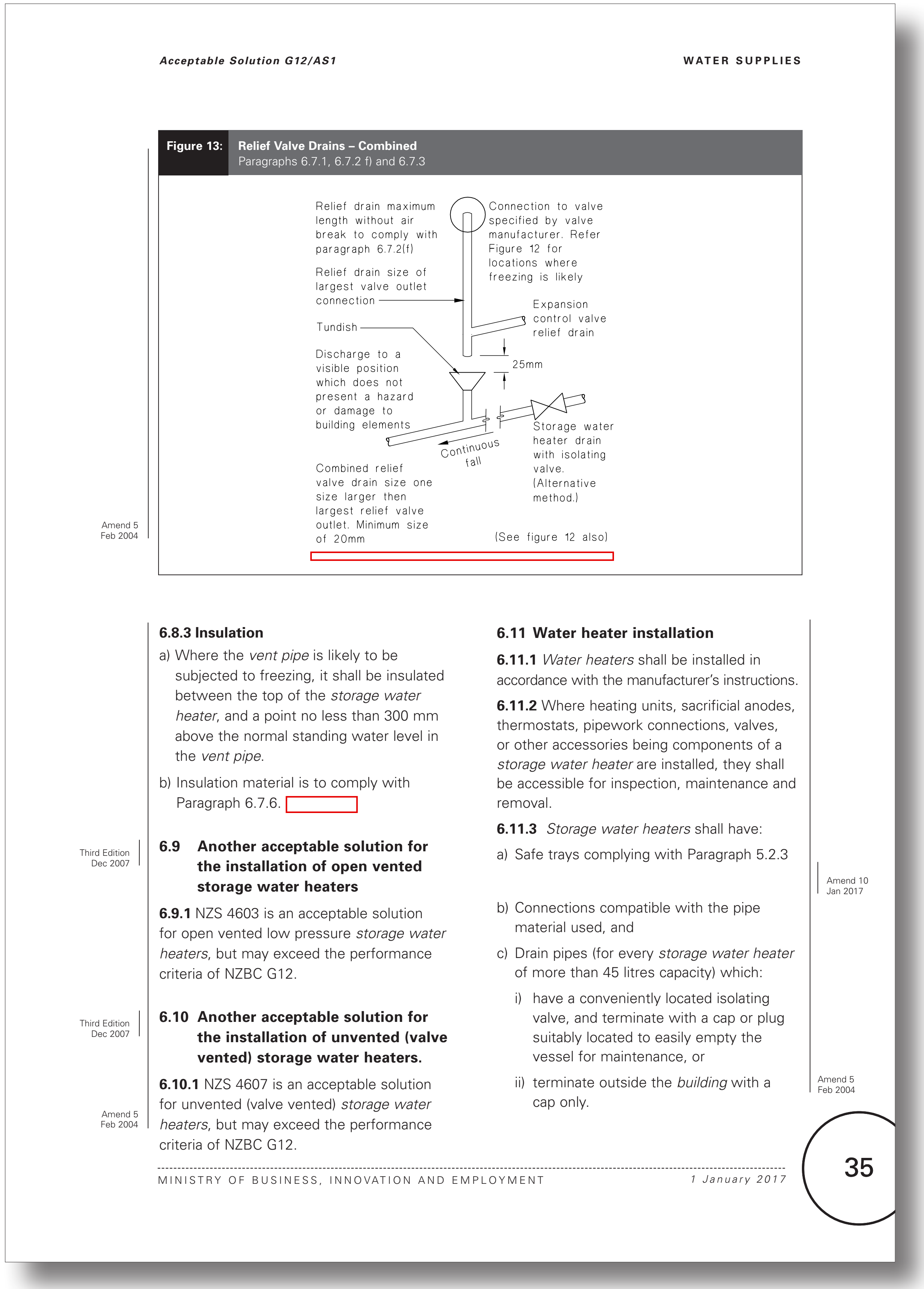
Appendix B. Proposed changes to the acceptable solutions and verification methods for clause G12 Water Supplies

Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



Acceptable Solution G12/AS1

WATER SUPPLIES

Figure 13: **Relief Valve Drains – Combined**
Paragraphs 6.7.1, 6.7.2 f) and 6.7.3

Amend 5
Feb 2004

6.8.3 Insulation

a) Where the *vent pipe* is likely to be subjected to freezing, it shall be insulated between the top of the *storage water heater*, and a point no less than 300 mm above the normal standing water level in the *vent pipe*.

b) Insulation material is to comply with Paragraph 6.7.6.

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6.9 Another acceptable solution for the installation of open vented storage water heaters

6.9.1 NZS 4603 is an acceptable solution for open vented low pressure *storage water heaters*, but may exceed the performance criteria of NZBC G12.

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6.10 Another acceptable solution for the installation of unvented (valve vented) storage water heaters.

Amend 5
Feb 2004

6.10.1 NZS 4607 is an acceptable solution for unvented (valve vented) *storage water heaters*, but may exceed the performance criteria of NZBC G12.

6.11 Water heater installation

6.11.1 *Water heaters* shall be installed in accordance with the manufacturer's instructions.

6.11.2 Where heating units, sacrificial anodes, thermostats, pipework connections, valves, or other accessories being components of a *storage water heater* are installed, they shall be accessible for inspection, maintenance and removal.

6.11.3 *Storage water heaters* shall have:

a) Safe trays complying with Paragraph 5.2.3

Amend 10
Jan 2017

b) Connections compatible with the pipe material used, and

c) Drain pipes (for every *storage water heater* of more than 45 litres capacity) which:

  i) have a conveniently located isolating valve, and terminate with a cap or plug suitably located to easily empty the vessel for maintenance, or

  ii) terminate outside the *building* with a cap only.

Amend 5
Feb 2004

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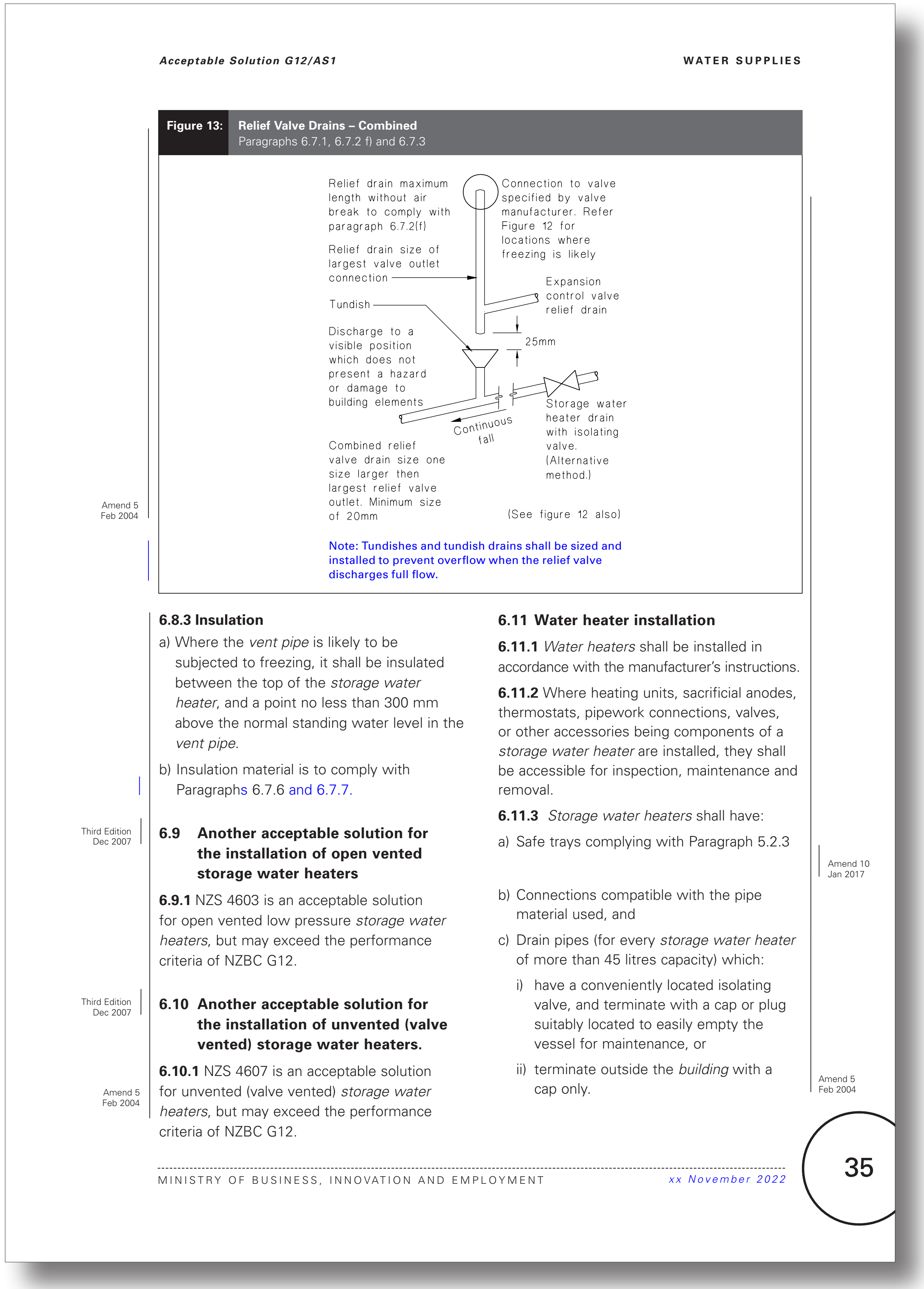
Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



Acceptable Solution G12/AS1

WATER SUPPLIES

Figure 13: **Relief Valve Drains – Combined**
Paragraphs 6.7.1, 6.7.2 f) and 6.7.3

Note: Tundishes and tundish drains shall be sized and installed to prevent overflow when the relief valve discharges full flow.

Amend 5
Feb 2004

6.8.3 Insulation

a) Where the *vent pipe* is likely to be subjected to freezing, it shall be insulated between the top of the *storage water heater*, and a point no less than 300 mm above the normal standing water level in the *vent pipe*.

b) Insulation material is to comply with Paragraphs 6.7.6 and 6.7.7.

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6.9 Another acceptable solution for the installation of open vented storage water heaters

6.9.1 NZS 4603 is an acceptable solution for open vented low pressure *storage water heaters*, but may exceed the performance criteria of NZBC G12.

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6.10 Another acceptable solution for the installation of unvented (valve vented) storage water heaters.

Amend 5
Feb 2004

6.10.1 NZS 4607 is an acceptable solution for unvented (valve vented) *storage water heaters*, but may exceed the performance criteria of NZBC G12.

6.11 Water heater installation

6.11.1 *Water heaters* shall be installed in accordance with the manufacturer's instructions.

6.11.2 Where heating units, sacrificial anodes, thermostats, pipework connections, valves, or other accessories being components of a *storage water heater* are installed, they shall be accessible for inspection, maintenance and removal.

6.11.3 *Storage water heaters* shall have:

a) Safe trays complying with Paragraph 5.2.3

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b) Connections compatible with the pipe material used, and

c) Drain pipes (for every *storage water heater* of more than 45 litres capacity) which:

  i) have a conveniently located isolating valve, and terminate with a cap or plug suitably located to easily empty the vessel for maintenance, or

  ii) terminate outside the *building* with a cap only.

Amend 5
Feb 2004

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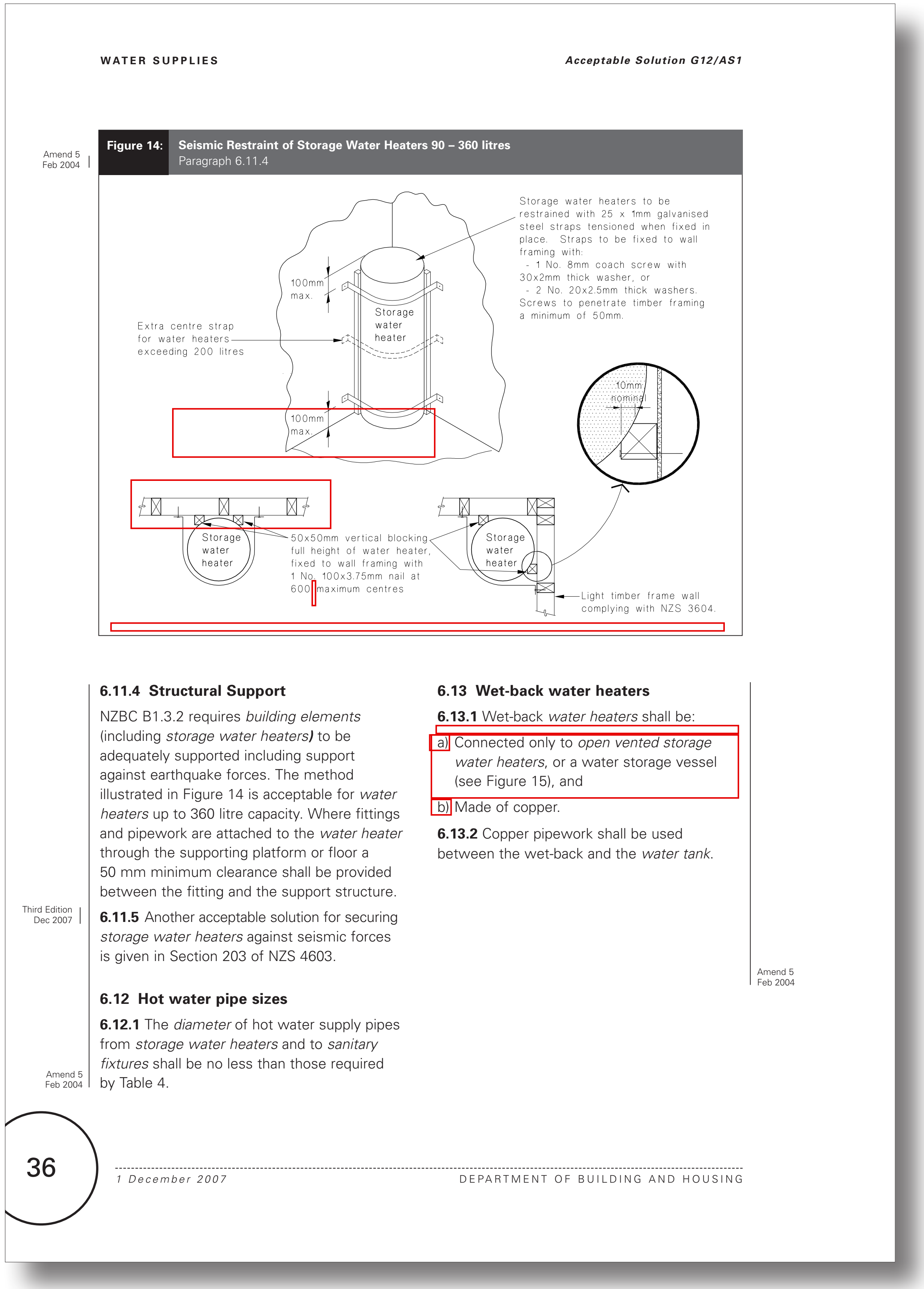
Current G12 Water Supplies acceptable solutions and verification methods (Text to be amended shown in red)



WATER SUPPLIES

Acceptable Solution G12/AS1

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Feb 2004

Figure 14: Seismic Restraint of Storage Water Heaters 90 – 360 litres
Paragraph 6.11.4

6.11.4 Structural Support

NZBC B1.3.2 requires *building elements* (including *storage water heaters)* to be adequately supported including support against earthquake forces. The method illustrated in Figure 14 is acceptable for *water heaters* up to 360 litre capacity. Where fittings and pipework are attached to the *water heater* through the supporting platform or floor a 50 mm minimum clearance shall be provided between the fitting and the support structure.

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6.11.5 Another acceptable solution for securing *storage water heaters* against seismic forces is given in Section 203 of NZS 4603.

6.12 Hot water pipe sizes

6.12.1 The *diameter* of hot water supply pipes from *storage water heaters* and to *sanitary fixtures* shall be no less than those required by Table 4.

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6.13 Wet-back water heaters

6.13.1 Wet-back *water heaters* shall be:

a) Connected only to *open vented storage water heaters*, or a water storage vessel (see Figure 15), and

b) Made of copper.

6.13.2 Copper pipework shall be used between the wet-back and the *water tank.*

Amend 5
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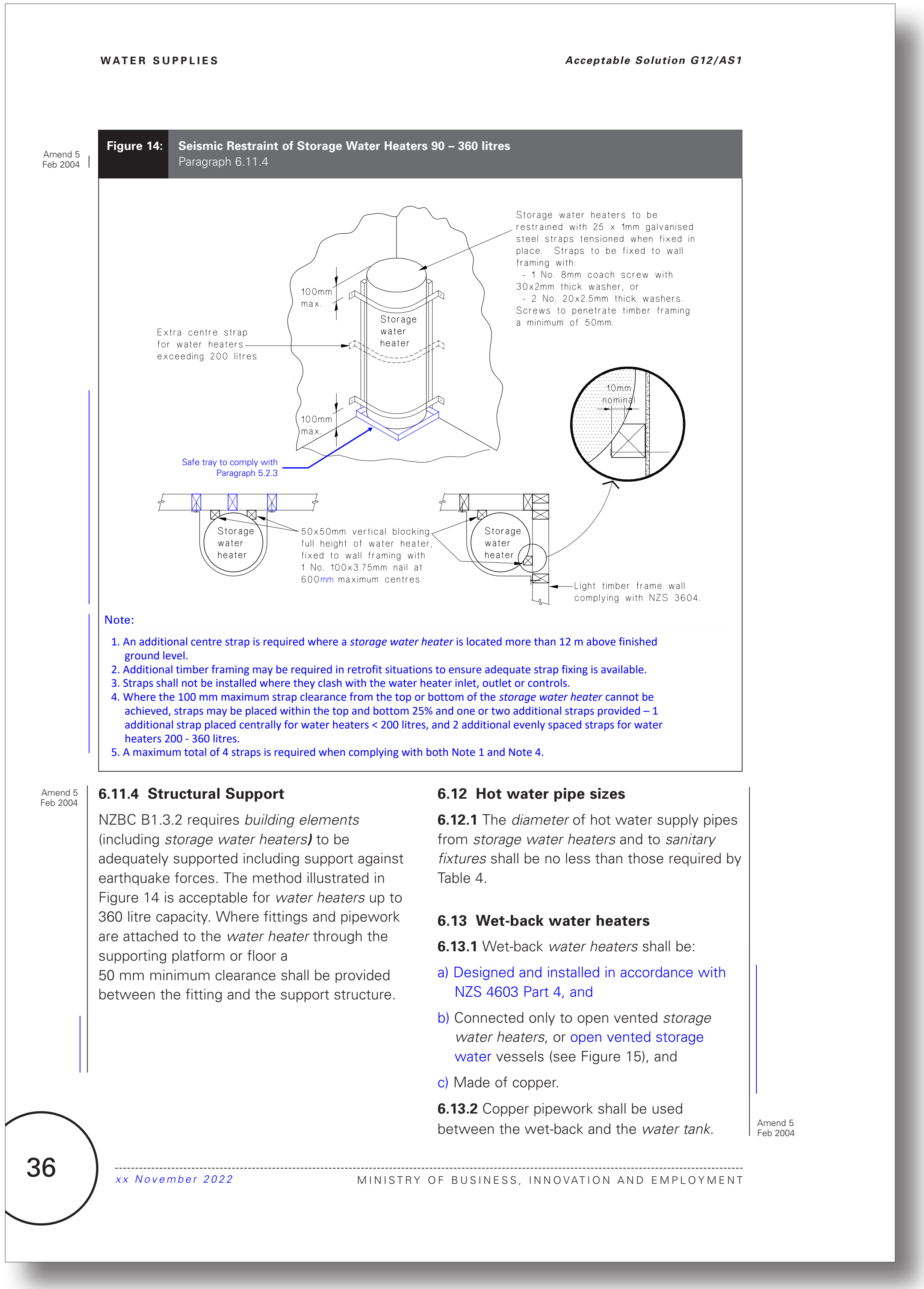
Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



WATER SUPPLIES

Acceptable Solution G12/AS1

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Figure 14: Seismic Restraint of Storage Water Heaters 90 – 360 litres
Paragraph 6.11.4

Note:

1. An additional centre strap is required where a *storage water heater* is located more than 12 m above finished ground level.
2. Additional timber framing may be required in retrofit situations to ensure adequate strap fixing is available.
3. Straps shall not be installed where they clash with the water heater inlet, outlet or controls.
4. Where the 100 mm maximum strap clearance from the top or bottom of the *storage water heater* cannot be achieved, straps may be placed within the top and bottom 25% and one or two additional straps provided – 1 additional strap placed centrally for water heaters < 200 litres, and 2 additional evenly spaced straps for water heaters 200 - 360 litres.
5. A maximum total of 4 straps is required when complying with both Note 1 and Note 4.

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6.11.4 Structural Support

NZBC B1.3.2 requires *building elements* (including *storage water heaters)* to be adequately supported including support against earthquake forces. The method illustrated in Figure 14 is acceptable for *water heaters* up to 360 litre capacity. Where fittings and pipework are attached to the *water heater* through the supporting platform or floor a 50 mm minimum clearance shall be provided between the fitting and the support structure.

6.12 Hot water pipe sizes

6.12.1 The *diameter* of hot water supply pipes from *storage water heaters* and to *sanitary fixtures* shall be no less than those required by Table 4.

6.13 Wet-back water heaters

6.13.1 Wet-back *water heaters* shall be:

a) Designed and installed in accordance with NZS 4603 Part 4, and

b) Connected only to open vented *storage water heaters*, or open vented storage water vessels (see Figure 15), and

c) Made of copper.

6.13.2 Copper pipework shall be used between the wet-back and the *water tank.*

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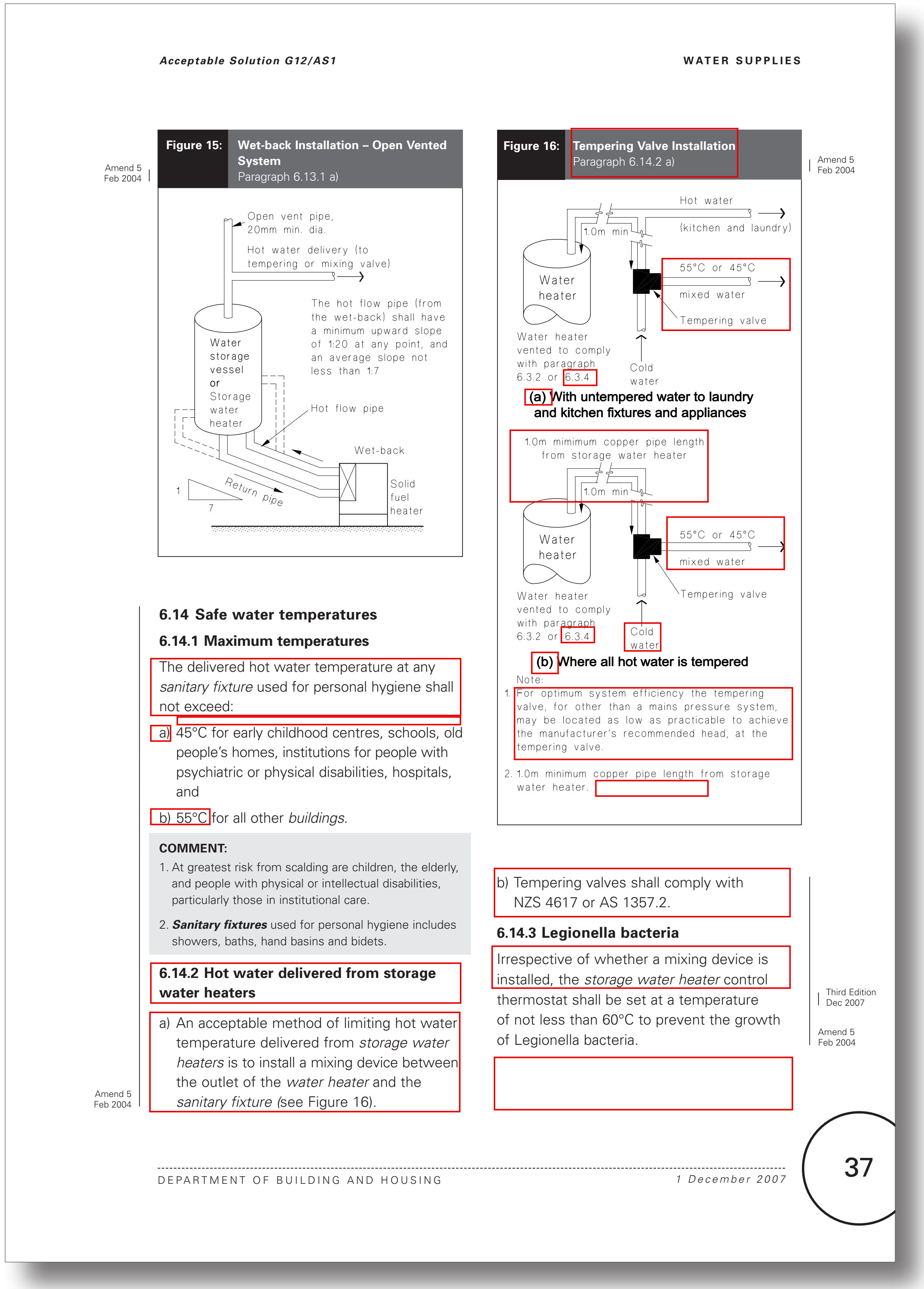
Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



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WATER SUPPLIES

Amend 5
Feb 2004

Figure 15: Wet-back Installation – Open Vented System
Paragraph 6.13.1 a)

6.14 Safe water temperatures

6.14.1 Maximum temperatures

The delivered hot water temperature at any *sanitary fixture* used for personal hygiene shall not exceed:

a) 45°C for early childhood centres, schools, old people's homes, institutions for people with psychiatric or physical disabilities, hospitals, and

b) 55°C for all other *buildings*.

COMMENT:

1. At greatest risk from scalding are children, the elderly, and people with physical or intellectual disabilities, particularly those in institutional care.
2. ***Sanitary fixtures*** used for personal hygiene includes showers, baths, hand basins and bidets.

6.14.2 Hot water delivered from storage water heaters

a) An acceptable method of limiting hot water temperature delivered from *storage water heaters* is to install a mixing device between the outlet of the *water heater* and the *sanitary fixture* (see Figure 16).

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Figure 16: Tempering Valve Installation
Paragraph 6.14.2 a)

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(a) With untempered water to laundry and kitchen fixtures and appliances

(b) Where all hot water is tempered

Note:

1. For optimum system efficiency the tempering valve, for other than a mains pressure system, may be located as low as practicable to achieve the manufacturer's recommended head, at the tempering valve.
2. 1.0m minimum copper pipe length from storage water heater.

b) Tempering valves shall comply with NZS 4617 or AS 1357.2.

6.14.3 Legionella bacteria

Irrespective of whether a mixing device is installed, the *storage water heater* control thermostat shall be set at a temperature of not less than 60°C to prevent the growth of Legionella bacteria.

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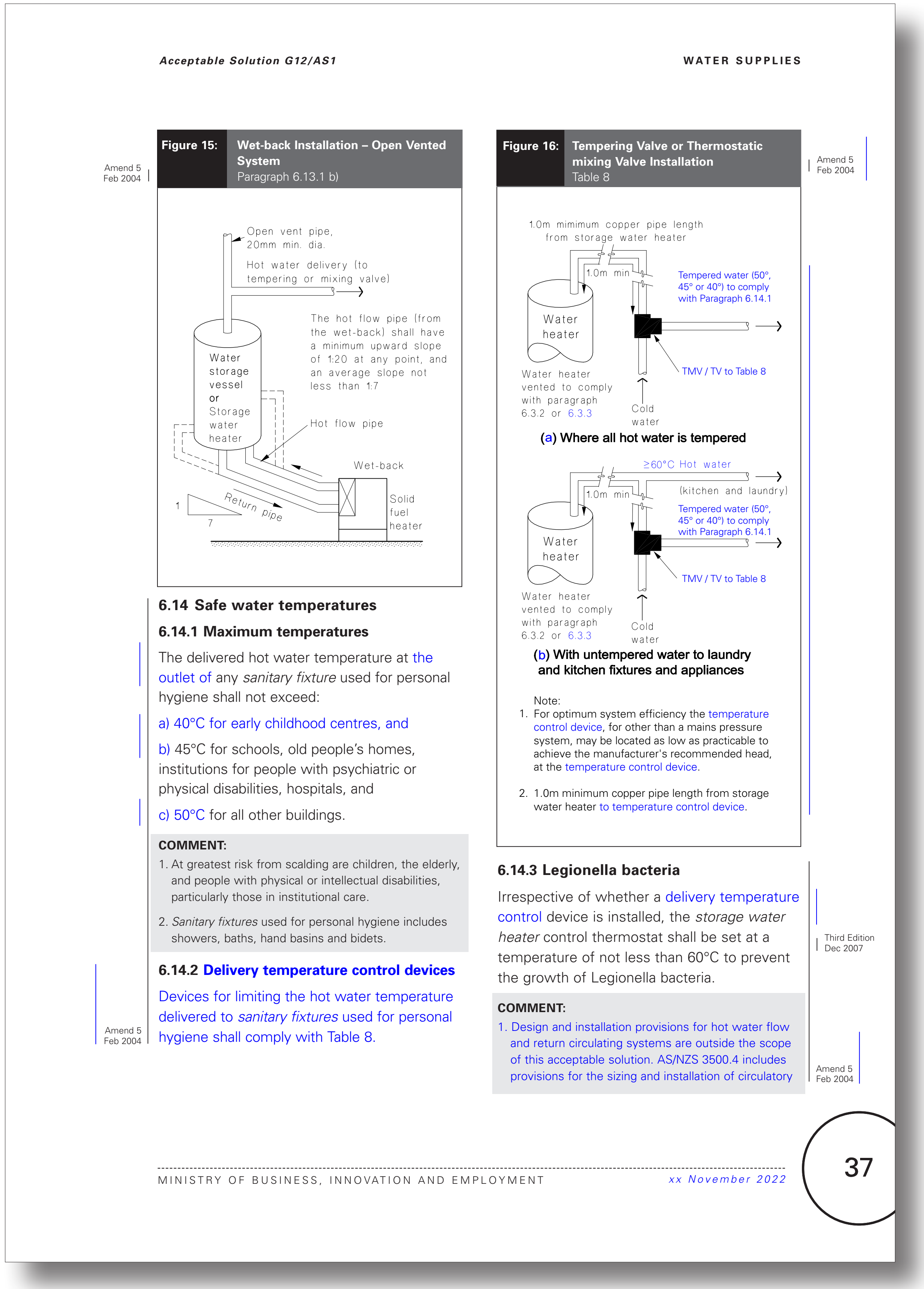
Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



Acceptable Solution G12/AS1

WATER SUPPLIES

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Figure 15: Wet-back Installation – Open Vented System
Paragraph 6.13.1 b)

6.14 Safe water temperatures

6.14.1 Maximum temperatures

The delivered hot water temperature at the outlet of any *sanitary fixture* used for personal hygiene shall not exceed:

a) 40°C for early childhood centres, and

b) 45°C for schools, old people's homes, institutions for people with psychiatric or physical disabilities, hospitals, and

c) 50°C for all other buildings.

COMMENT:

1. At greatest risk from scalding are children, the elderly, and people with physical or intellectual disabilities, particularly those in institutional care.
2. *Sanitary fixtures* used for personal hygiene includes showers, baths, hand basins and bidets.

6.14.2 Delivery temperature control devices

Devices for limiting the hot water temperature delivered to *sanitary fixtures* used for personal hygiene shall comply with Table 8.

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Figure 16: Tempering Valve or Thermostatic mixing Valve Installation
Table 8

Amend 5
Feb 2004

(a) Where all hot water is tempered

(b) With untempered water to laundry and kitchen fixtures and appliances

Note:

1. For optimum system efficiency the temperature control device, for other than a mains pressure system, may be located as low as practicable to achieve the manufacturer's recommended head, at the temperature control device.
2. 1.0m minimum copper pipe length from storage water heater to temperature control device.

6.14.3 Legionella bacteria

Irrespective of whether a delivery temperature control device is installed, the *storage water heater* control thermostat shall be set at a temperature of not less than 60°C to prevent the growth of Legionella bacteria.

COMMENT:

1. Design and installation provisions for hot water flow and return circulating systems are outside the scope of this acceptable solution. AS/NZS 3500.4 includes provisions for the sizing and installation of circulatory

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Current G12 Water Supplies acceptable solutions and verification methods

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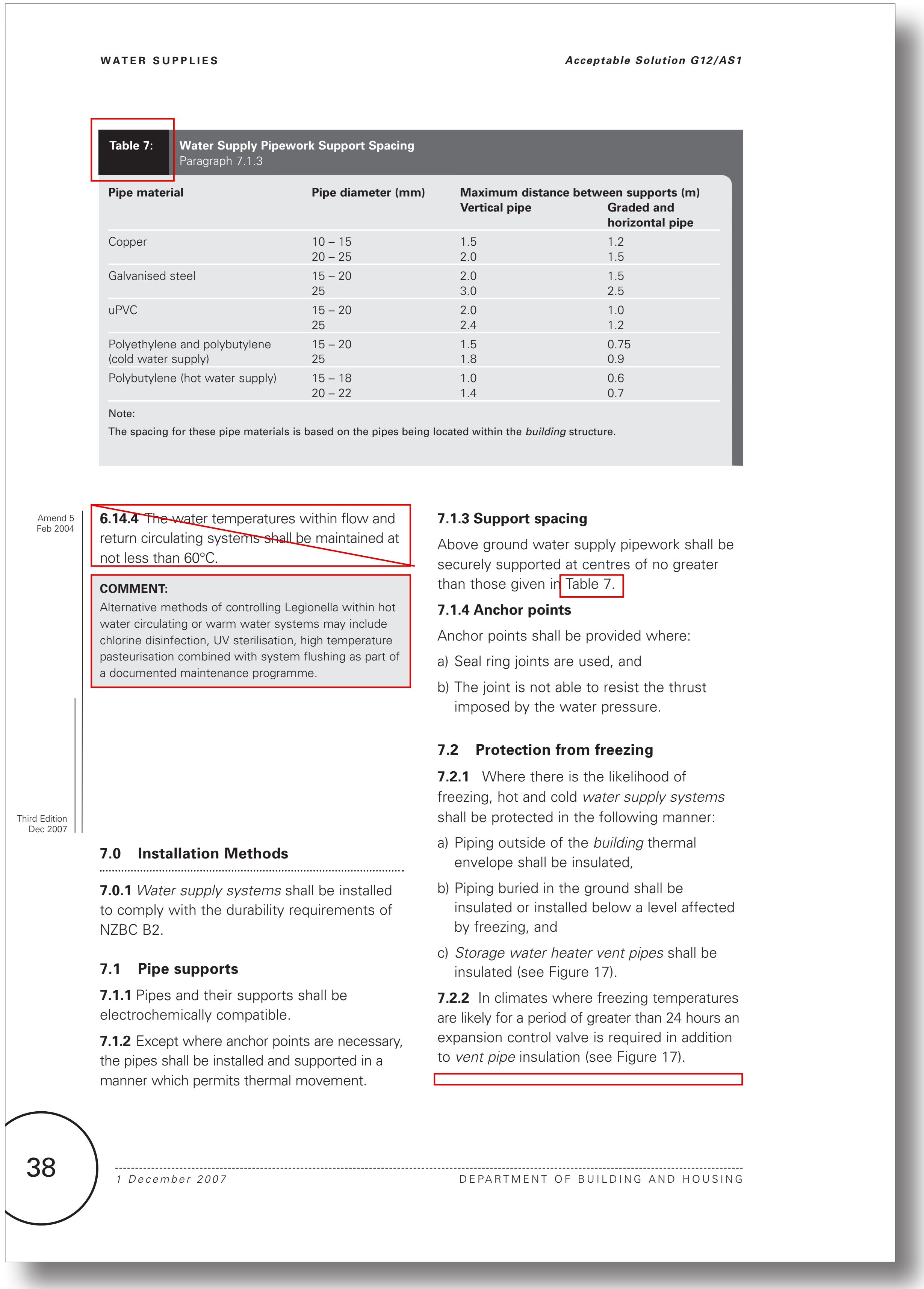

WATER SUPPLIES

Acceptable Solution G12/AS1

Table 7: **Water Supply Pipework Support Spacing**
Paragraph 7.1.3

Pipe material	Pipe diameter (mm)	Maximum distance between supports (m) Vertical pipe	Graded and horizontal pipe
Copper	10 – 15 20 – 25	1.5 2.0	1.2 1.5
Galvanised steel	15 – 20 25	2.0 3.0	1.5 2.5
uPVC	15 – 20 25	2.0 2.4	1.0 1.2
Polyethylene and polybutylene (cold water supply)	15 – 20 25	1.5 1.8	0.75 0.9
Polybutylene (hot water supply)	15 – 18 20 – 22	1.0 1.4	0.6 0.7

Note:
The spacing for these pipe materials is based on the pipes being located within the *building* structure.

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~~**6.14.4** The water temperatures within flow and return circulating systems shall be maintained at not less than 60°C.~~

COMMENT:
Alternative methods of controlling Legionella within hot water circulating or warm water systems may include chlorine disinfection, UV sterilisation, high temperature pasteurisation combined with system flushing as part of a documented maintenance programme.

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7.0 Installation Methods

7.0.1 *Water supply systems* shall be installed to comply with the durability requirements of NZBC B2.

7.1 Pipe supports

7.1.1 Pipes and their supports shall be electrochemically compatible.

7.1.2 Except where anchor points are necessary, the pipes shall be installed and supported in a manner which permits thermal movement.

7.1.3 Support spacing

Above ground water supply pipework shall be securely supported at centres of no greater than those given in Table 7.

7.1.4 Anchor points

Anchor points shall be provided where:

a) Seal ring joints are used, and

b) The joint is not able to resist the thrust imposed by the water pressure.

7.2 Protection from freezing

7.2.1 Where there is the likelihood of freezing, hot and cold *water supply systems* shall be protected in the following manner:

a) Piping outside of the *building* thermal envelope shall be insulated,

b) Piping buried in the ground shall be insulated or installed below a level affected by freezing, and

c) *Storage water heater vent pipes* shall be insulated (see Figure 17).

7.2.2 In climates where freezing temperatures are likely for a period of greater than 24 hours an expansion control valve is required in addition to *vent pipe* insulation (see Figure 17).

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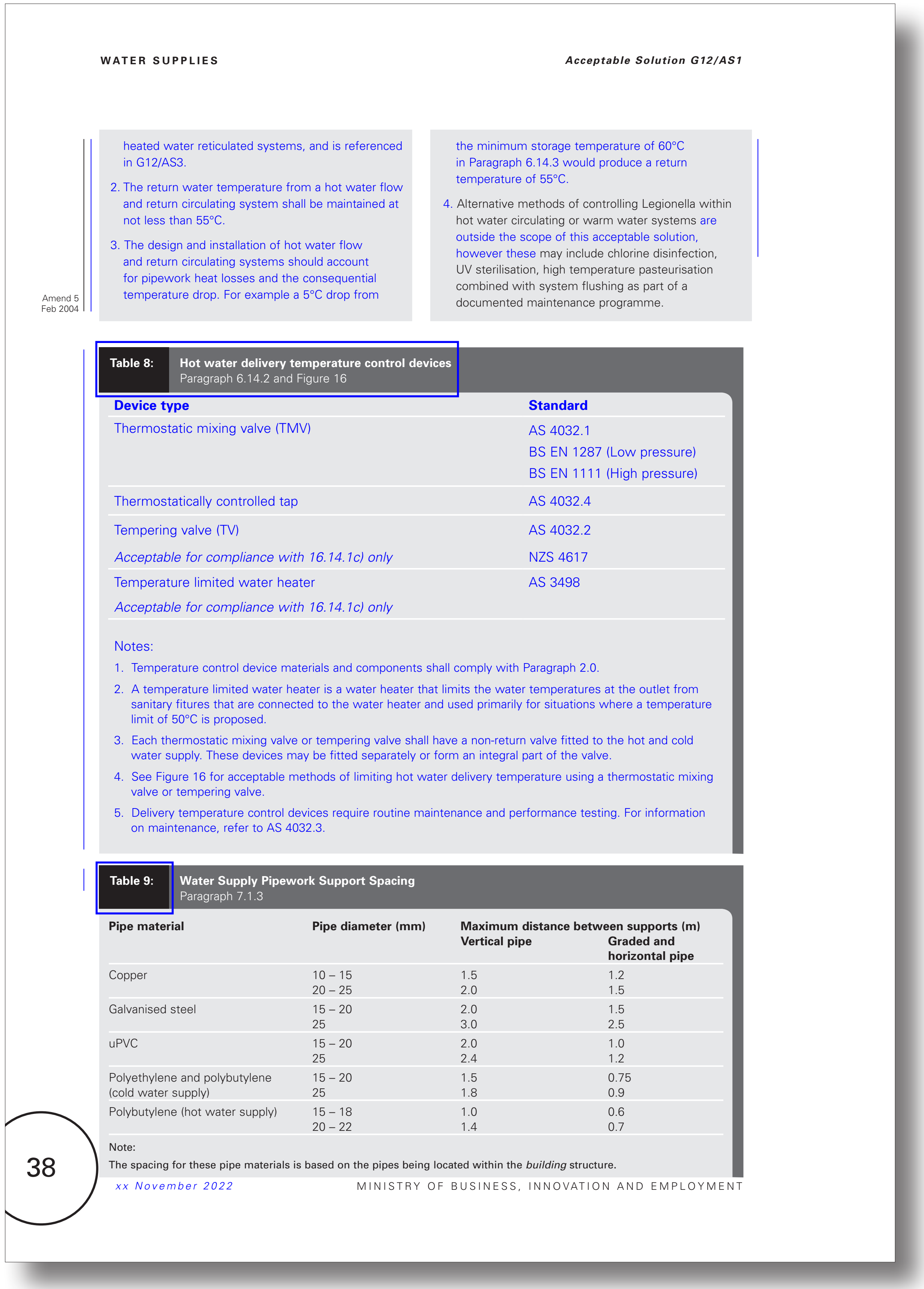
Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



WATER SUPPLIES

Acceptable Solution G12/AS1

heated water reticulated systems, and is referenced in G12/AS3.

2. The return water temperature from a hot water flow and return circulating system shall be maintained at not less than 55°C.
3. The design and installation of hot water flow and return circulating systems should account for pipework heat losses and the consequential temperature drop. For example a 5°C drop from the minimum storage temperature of 60°C in Paragraph 6.14.3 would produce a return temperature of 55°C.
4. Alternative methods of controlling Legionella within hot water circulating or warm water systems are outside the scope of this acceptable solution, however these may include chlorine disinfection, UV sterilisation, high temperature pasteurisation combined with system flushing as part of a documented maintenance programme.

Amend 5 Feb 2004

Table 8: **Hot water delivery temperature control devices**
Paragraph 6.14.2 and Figure 16

Device type	**Standard**
Thermostatic mixing valve (TMV)	AS 4032.1 BS EN 1287 (Low pressure) BS EN 1111 (High pressure)
Thermostatically controlled tap	AS 4032.4
Tempering valve (TV)	AS 4032.2
Acceptable for compliance with 16.14.1c) only	NZS 4617
Temperature limited water heater	AS 3498
Acceptable for compliance with 16.14.1c) only	

Notes:

1. Temperature control device materials and components shall comply with Paragraph 2.0.
2. A temperature limited water heater is a water heater that limits the water temperatures at the outlet from sanitary fitures that are connected to the water heater and used primarily for situations where a temperature limit of 50°C is proposed.
3. Each thermostatic mixing valve or tempering valve shall have a non-return valve fitted to the hot and cold water supply. These devices may be fitted separately or form an integral part of the valve.
4. See Figure 16 for acceptable methods of limiting hot water delivery temperature using a thermostatic mixing valve or tempering valve.
5. Delivery temperature control devices require routine maintenance and performance testing. For information on maintenance, refer to AS 4032.3.

Table 9: **Water Supply Pipework Support Spacing**
Paragraph 7.1.3

Pipe material	Pipe diameter (mm)	Maximum distance between supports (m) Vertical pipe	Graded and horizontal pipe
Copper	10 – 15 20 – 25	1.5 2.0	1.2 1.5
Galvanised steel	15 – 20 25	2.0 3.0	1.5 2.5
uPVC	15 – 20 25	2.0 2.4	1.0 1.2
Polyethylene and polybutylene (cold water supply)	15 – 20 25	1.5 1.8	0.75 0.9
Polybutylene (hot water supply)	15 – 18 20 – 22	1.0 1.4	0.6 0.7

Note:
The spacing for these pipe materials is based on the pipes being located within the *building* structure.

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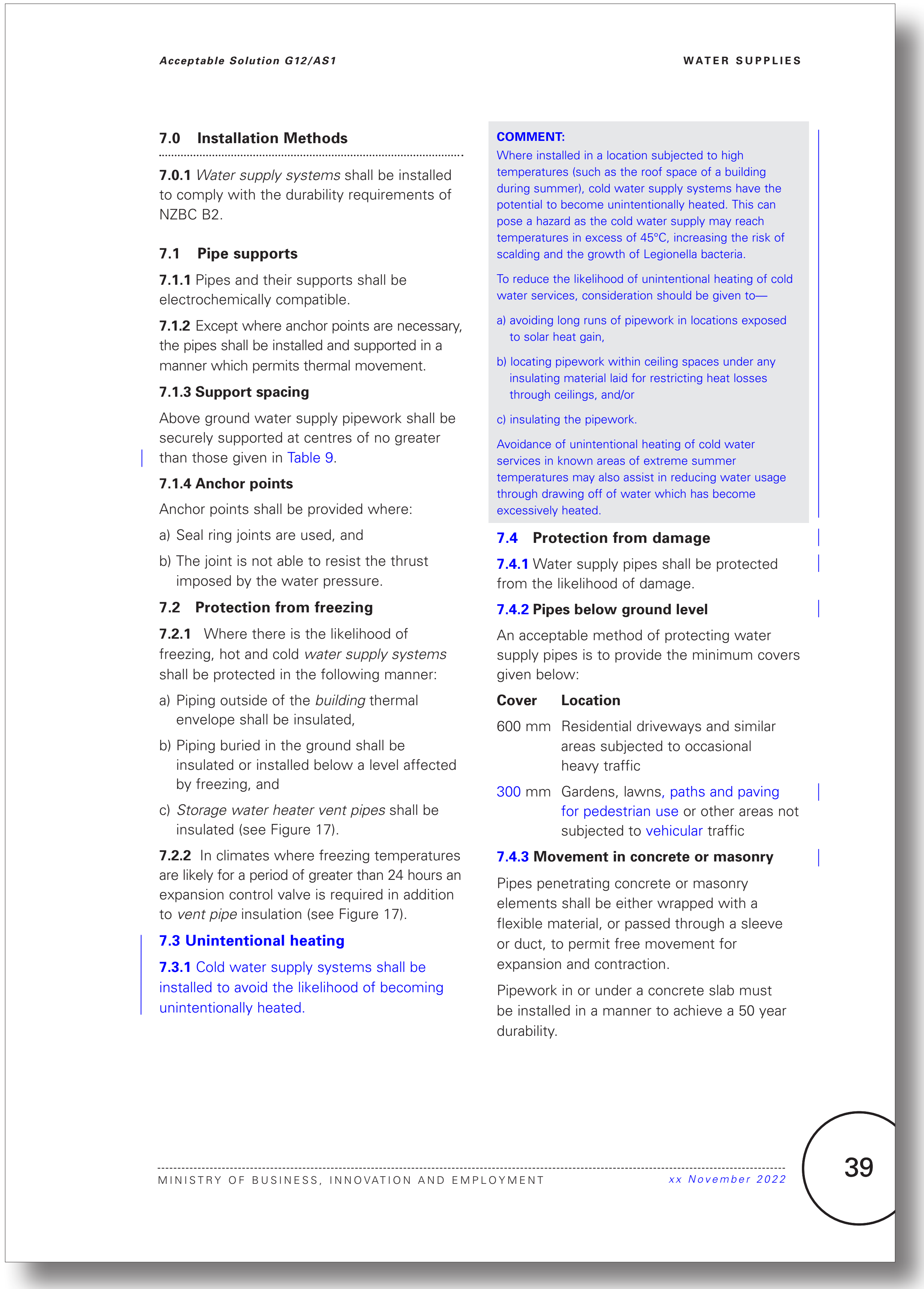
Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods

(Proposed text in blue)



Acceptable Solution G12/AS1 WATER SUPPLIES

7.0 Installation Methods

7.0.1 *Water supply systems* shall be installed to comply with the durability requirements of NZBC B2.

7.1 Pipe supports

7.1.1 Pipes and their supports shall be electrochemically compatible.

7.1.2 Except where anchor points are necessary, the pipes shall be installed and supported in a manner which permits thermal movement.

7.1.3 Support spacing

Above ground water supply pipework shall be securely supported at centres of no greater than those given in Table 9.

7.1.4 Anchor points

Anchor points shall be provided where:

a) Seal ring joints are used, and

b) The joint is not able to resist the thrust imposed by the water pressure.

7.2 Protection from freezing

7.2.1 Where there is the likelihood of freezing, hot and cold *water supply systems* shall be protected in the following manner:

a) Piping outside of the *building* thermal envelope shall be insulated,

b) Piping buried in the ground shall be insulated or installed below a level affected by freezing, and

c) *Storage water heater vent pipes* shall be insulated (see Figure 17).

7.2.2 In climates where freezing temperatures are likely for a period of greater than 24 hours an expansion control valve is required in addition to *vent pipe* insulation (see Figure 17).

7.3 Unintentional heating

7.3.1 Cold water supply systems shall be installed to avoid the likelihood of becoming unintentionally heated.

COMMENT:

Where installed in a location subjected to high temperatures (such as the roof space of a building during summer), cold water supply systems have the potential to become unintentionally heated. This can pose a hazard as the cold water supply may reach temperatures in excess of 45°C, increasing the risk of scalding and the growth of Legionella bacteria.

To reduce the likelihood of unintentional heating of cold water services, consideration should be given to—

a) avoiding long runs of pipework in locations exposed to solar heat gain,

b) locating pipework within ceiling spaces under any insulating material laid for restricting heat losses through ceilings, and/or

c) insulating the pipework.

Avoidance of unintentional heating of cold water services in known areas of extreme summer temperatures may also assist in reducing water usage through drawing off of water which has become excessively heated.

7.4 Protection from damage

7.4.1 Water supply pipes shall be protected from the likelihood of damage.

7.4.2 Pipes below ground level

An acceptable method of protecting water supply pipes is to provide the minimum covers given below:

Cover	Location
600 mm	Residential driveways and similar areas subjected to occasional heavy traffic
300 mm	Gardens, lawns, paths and paving for pedestrian use or other areas not subjected to vehicular traffic

7.4.3 Movement in concrete or masonry

Pipes penetrating concrete or masonry elements shall be either wrapped with a flexible material, or passed through a sleeve or duct, to permit free movement for expansion and contraction.

Pipework in or under a concrete slab must be installed in a manner to achieve a 50 year durability.

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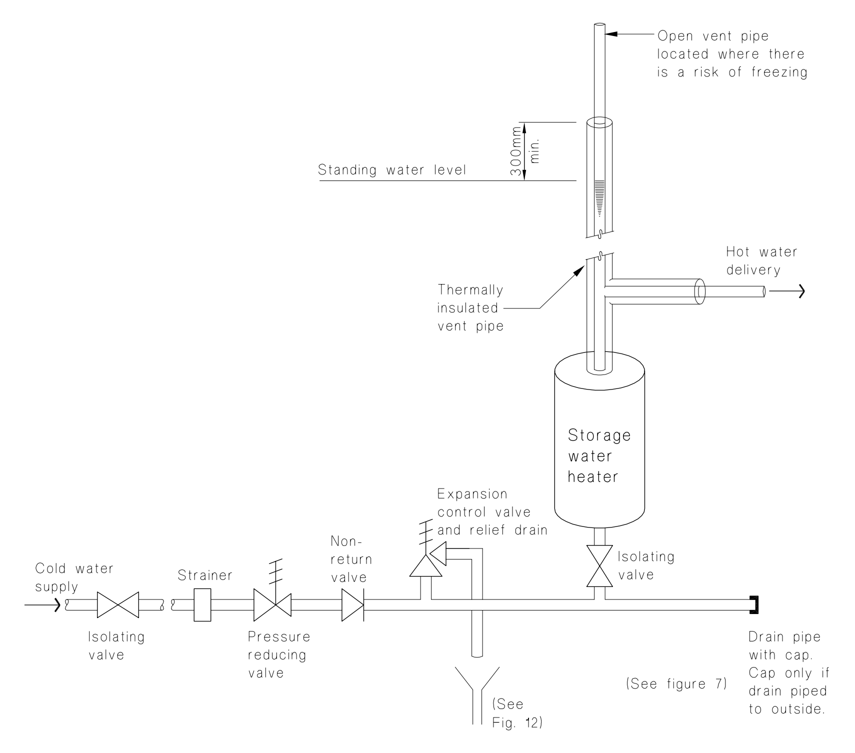
Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)

Acceptable Solution G12/AS1 WATER SUPPLIES

Figure 17: **Open Vented Storage Water Heaters in Climates Subject to Freezing**
Paragraphs 7.2.1 c) and 7.2.2



7.3 Protection from damage

7.3.1 Water supply pipes shall be protected from the likelihood of damage.

7.3.2 Pipes below ground level

An acceptable method of protecting water supply pipes is to provide the minimum covers given below:

Cover	**Location**
600 mm	Residential driveways and similar areas subjected to occasional heavy traffic
450 mm	Gardens, lawns or other areas not subjected to traffic

7.3.3 Movement in concrete or masonry

Pipes penetrating concrete or masonry elements shall be either wrapped with a flexible material, or passed through a sleeve or duct, to permit free movement for expansion and contraction.

Pipework in or under a concrete slab must be installed in a manner to achieve a 50 year durability.

7.4 Installation of uPVC Pipes

7.4.1 An acceptable method of installing uPVC pipe is given in NZS 7643.

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Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)

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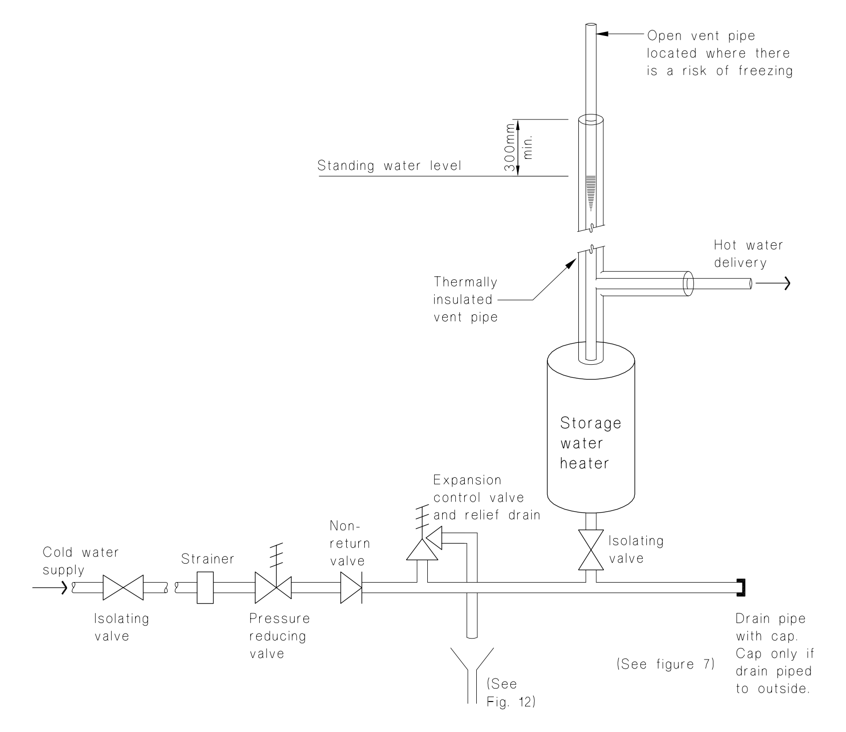
Figure 17: **Open Vented Storage Water Heaters in Climates Subject to Freezing**
Paragraphs 7.2.1 c) and 7.2.2



7.5 Installation of pipework systems

7.5.1 An acceptable method of installing PVC-U pipework systems is given in AS/NZS 2032.

7.5.2 An acceptable method of installing polyethylene pipework systems is given in AS/NZS 2033.

7.5.3 An acceptable method of installing copper pipework systems is given in AS 4809.

7.6 Watertightness

7.6.1 The *water supply system* shall be tested to ensure watertightness. An acceptable testing method is to:

a) Subject the hot and cold system to a pressure of 1500 kPa for a period of not less than 15 minutes, and

b) Inspect the system to ensure that there are no leaks.

COMMENT:

1. Testing should be carried out before concealing pipework behind interior linings, flooring or within concrete, or before backfilling trenches.
2. All *fixtures*, appliances, *water tanks, storage water heaters* and other equipment, which may be damaged during pressure testing, should be isolated before testing.

7.6.2 Another acceptable method for testing PVC-U pipework systems is given in AS/NZS 2032 Section 7.

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Feb 2014

7.7 Flushing

7.7.1 Newly installed and altered water supply systems shall be flushed at each discharge point to remove any dirty water or debris on completion of construction.

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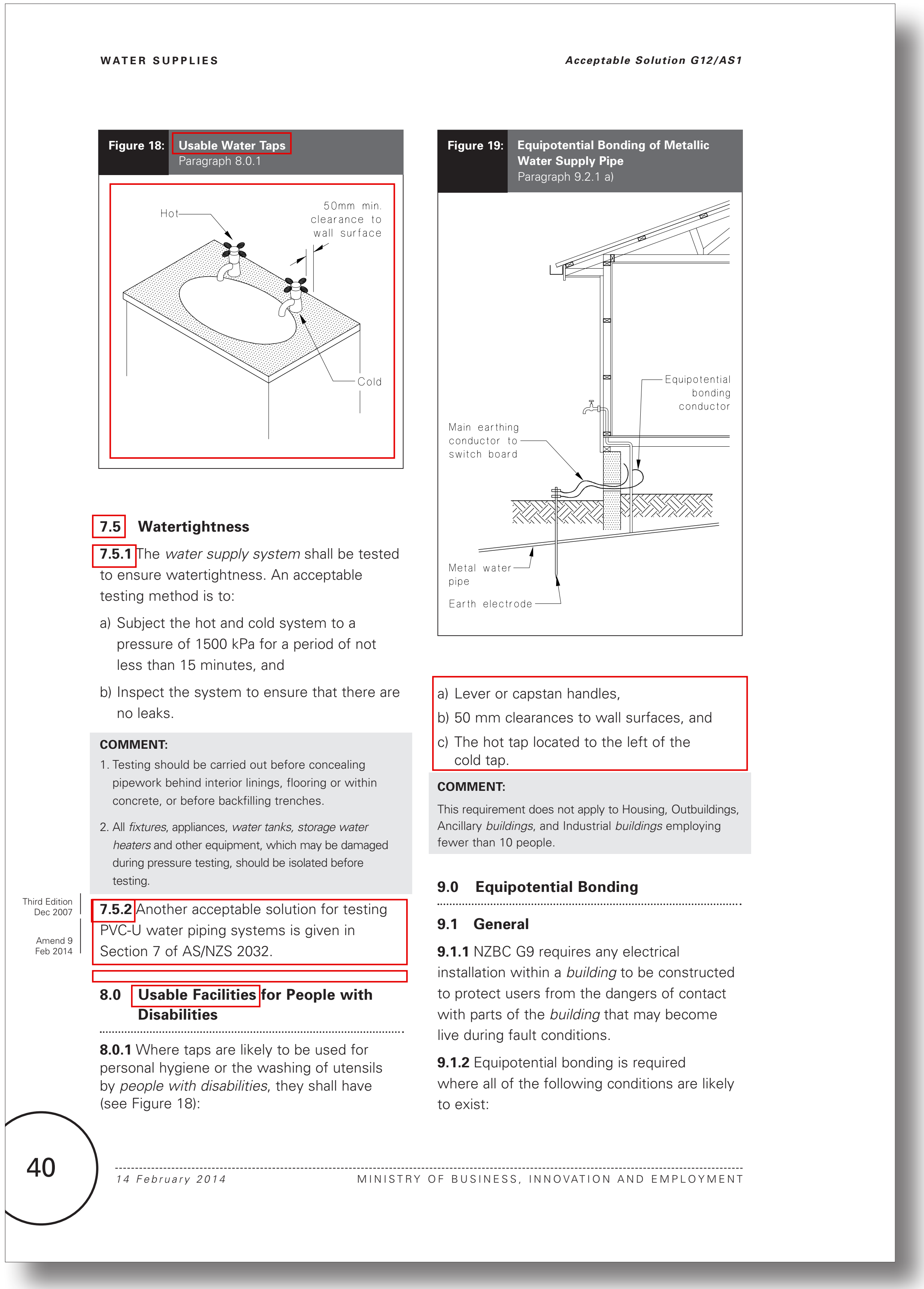
Appendix B. Proposed changes to the acceptable solutions and verification methods for clause G12 Water Supplies

Current G12 Water Supplies acceptable solutions and verification methods
(Text to be amended shown in red)



WATER SUPPLIES

Acceptable Solution G12/AS1

Figure 18: **Usable Water Taps**
Paragraph 8.0.1

7.5 Watertightness

7.5.1 The *water supply system* shall be tested to ensure watertightness. An acceptable testing method is to:

a) Subject the hot and cold system to a pressure of 1500 kPa for a period of not less than 15 minutes, and

b) Inspect the system to ensure that there are no leaks.

COMMENT:

1. Testing should be carried out before concealing pipework behind interior linings, flooring or within concrete, or before backfilling trenches.
2. All *fixtures*, appliances, *water tanks*, *storage water heaters* and other equipment, which may be damaged during pressure testing, should be isolated before testing.

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Amend 9 Feb 2014

7.5.2 Another acceptable solution for testing PVC-U water piping systems is given in Section 7 of AS/NZS 2032.

8.0 Usable Facilities for People with Disabilities

8.0.1 Where taps are likely to be used for personal hygiene or the washing of utensils by *people with disabilities*, they shall have (see Figure 18):

Figure 19: **Equipotential Bonding of Metallic Water Supply Pipe**
Paragraph 9.2.1 a)

a) Lever or capstan handles,

b) 50 mm clearances to wall surfaces, and

c) The hot tap located to the left of the cold tap.

COMMENT:

This requirement does not apply to Housing, Outbuildings, Ancillary *buildings*, and Industrial *buildings* employing fewer than 10 people.

9.0 Equipotential Bonding

9.1 General

9.1.1 NZBC G9 requires any electrical installation within a *building* to be constructed to protect users from the dangers of contact with parts of the *building* that may become live during fault conditions.

9.1.2 Equipotential bonding is required where all of the following conditions are likely to exist:

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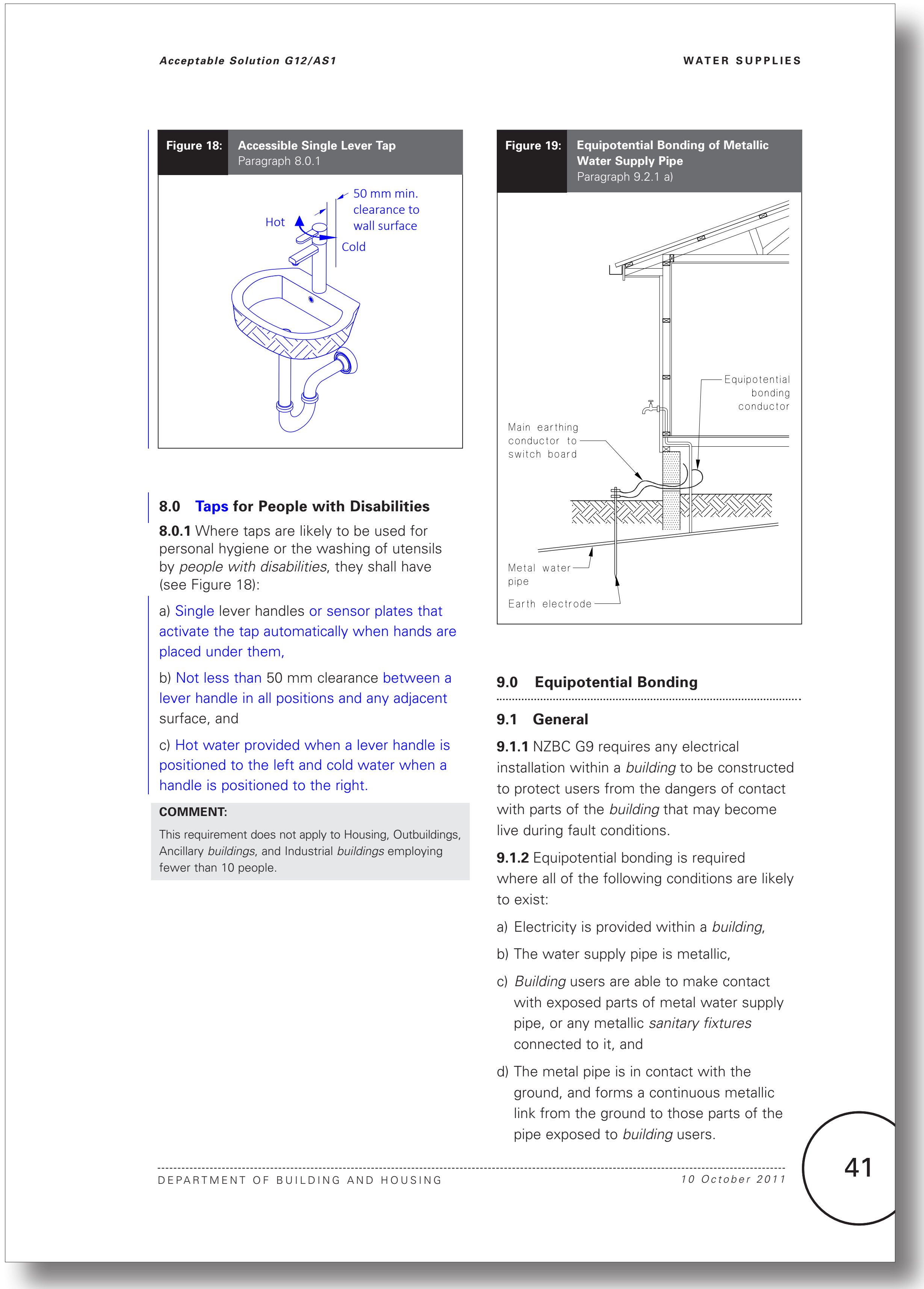
14 February 2014 MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



Acceptable Solution G12/AS1

WATER SUPPLIES

Figure 18: **Accessible Single Lever Tap**
Paragraph 8.0.1

8.0 Taps for People with Disabilities

8.0.1 Where taps are likely to be used for personal hygiene or the washing of utensils by *people with disabilities*, they shall have (see Figure 18):

a) Single lever handles or sensor plates that activate the tap automatically when hands are placed under them,

b) Not less than 50 mm clearance between a lever handle in all positions and any adjacent surface, and

c) Hot water provided when a lever handle is positioned to the left and cold water when a handle is positioned to the right.

COMMENT:

This requirement does not apply to Housing, Outbuildings, Ancillary *buildings*, and Industrial *buildings* employing fewer than 10 people.

Figure 19: **Equipotential Bonding of Metallic Water Supply Pipe**
Paragraph 9.2.1 a)

9.0 Equipotential Bonding

9.1 General

9.1.1 NZBC G9 requires any electrical installation within a *building* to be constructed to protect users from the dangers of contact with parts of the *building* that may become live during fault conditions.

9.1.2 Equipotential bonding is required where all of the following conditions are likely to exist:

a) Electricity is provided within a *building*,

b) The water supply pipe is metallic,

c) *Building* users are able to make contact with exposed parts of metal water supply pipe, or any metallic *sanitary fixtures* connected to it, and

d) The metal pipe is in contact with the ground, and forms a continuous metallic link from the ground to those parts of the pipe exposed to *building* users.

DEPARTMENT OF BUILDING AND HOUSING *10 October 2011*

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Current G12 Water Supplies - No changes proposed to this page

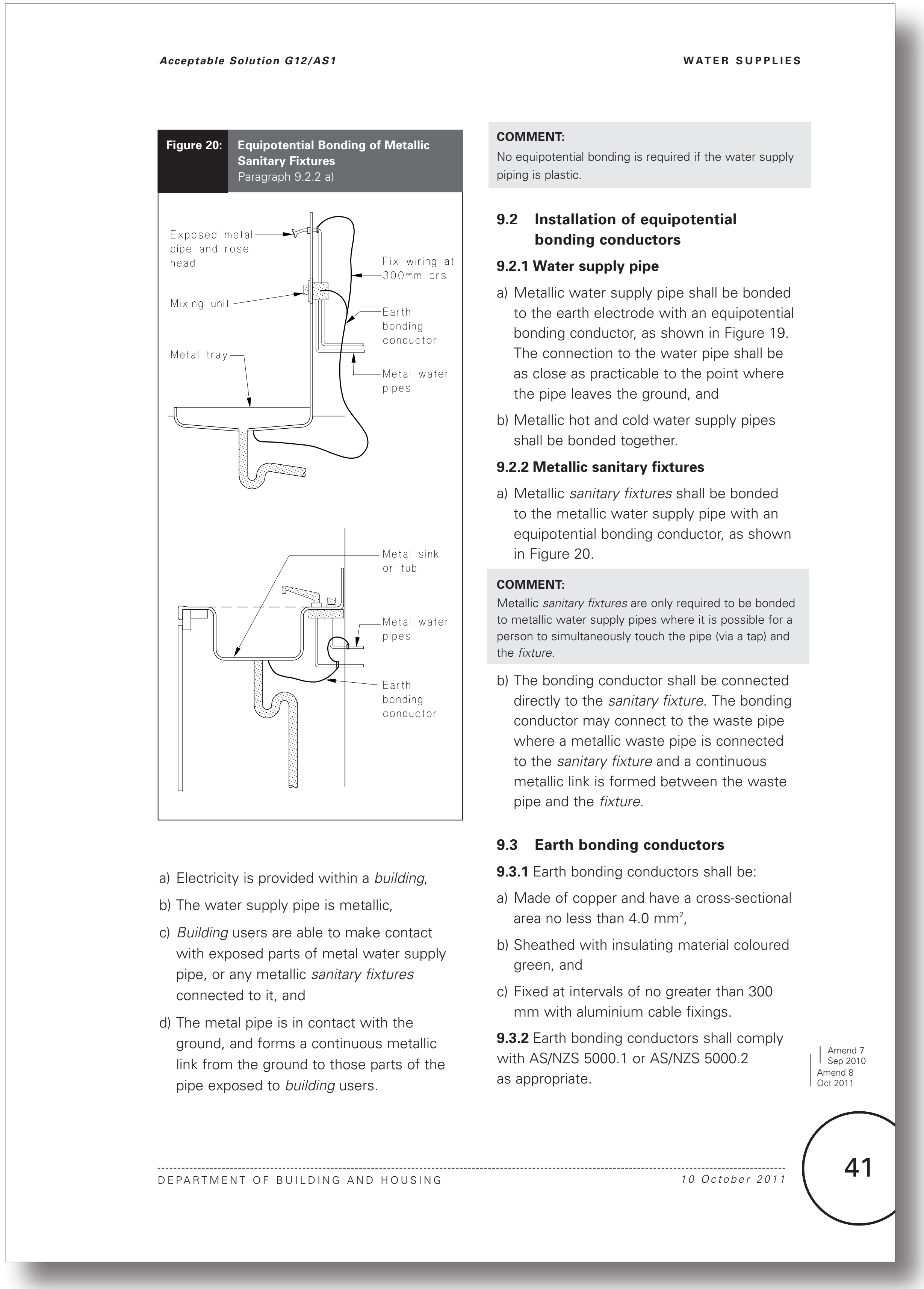

Figure 20: **Equipotential Bonding of Metallic Sanitary Fixtures**
Paragraph 9.2.2 a)

a) Electricity is provided within a *building*,

b) The water supply pipe is metallic,

c) *Building* users are able to make contact with exposed parts of metal water supply pipe, or any metallic *sanitary fixtures* connected to it, and

d) The metal pipe is in contact with the ground, and forms a continuous metallic link from the ground to those parts of the pipe exposed to *building* users.

COMMENT:
No equipotential bonding is required if the water supply piping is plastic.

9.2 Installation of equipotential bonding conductors

9.2.1 Water supply pipe

a) Metallic water supply pipe shall be bonded to the earth electrode with an equipotential bonding conductor, as shown in Figure 19. The connection to the water pipe shall be as close as practicable to the point where the pipe leaves the ground, and

b) Metallic hot and cold water supply pipes shall be bonded together.

9.2.2 Metallic sanitary fixtures

a) Metallic *sanitary fixtures* shall be bonded to the metallic water supply pipe with an equipotential bonding conductor, as shown in Figure 20.

COMMENT:
Metallic *sanitary fixtures* are only required to be bonded to metallic water supply pipes where it is possible for a person to simultaneously touch the pipe (via a tap) and the *fixture*.

b) The bonding conductor shall be connected directly to the *sanitary fixture*. The bonding conductor may connect to the waste pipe where a metallic waste pipe is connected to the *sanitary fixture* and a continuous metallic link is formed between the waste pipe and the *fixture*.

9.3 Earth bonding conductors

9.3.1 Earth bonding conductors shall be:

a) Made of copper and have a cross-sectional area no less than 4.0 mm^2,

b) Sheathed with insulating material coloured green, and

c) Fixed at intervals of no greater than 300 mm with aluminium cable fixings.

9.3.2 Earth bonding conductors shall comply with AS/NZS 5000.1 or AS/NZS 5000.2 as appropriate.

Amend 7 Sep 2010
Amend 8 Oct 2011

Proposed G12 Water Supplies - No changes proposed to this page

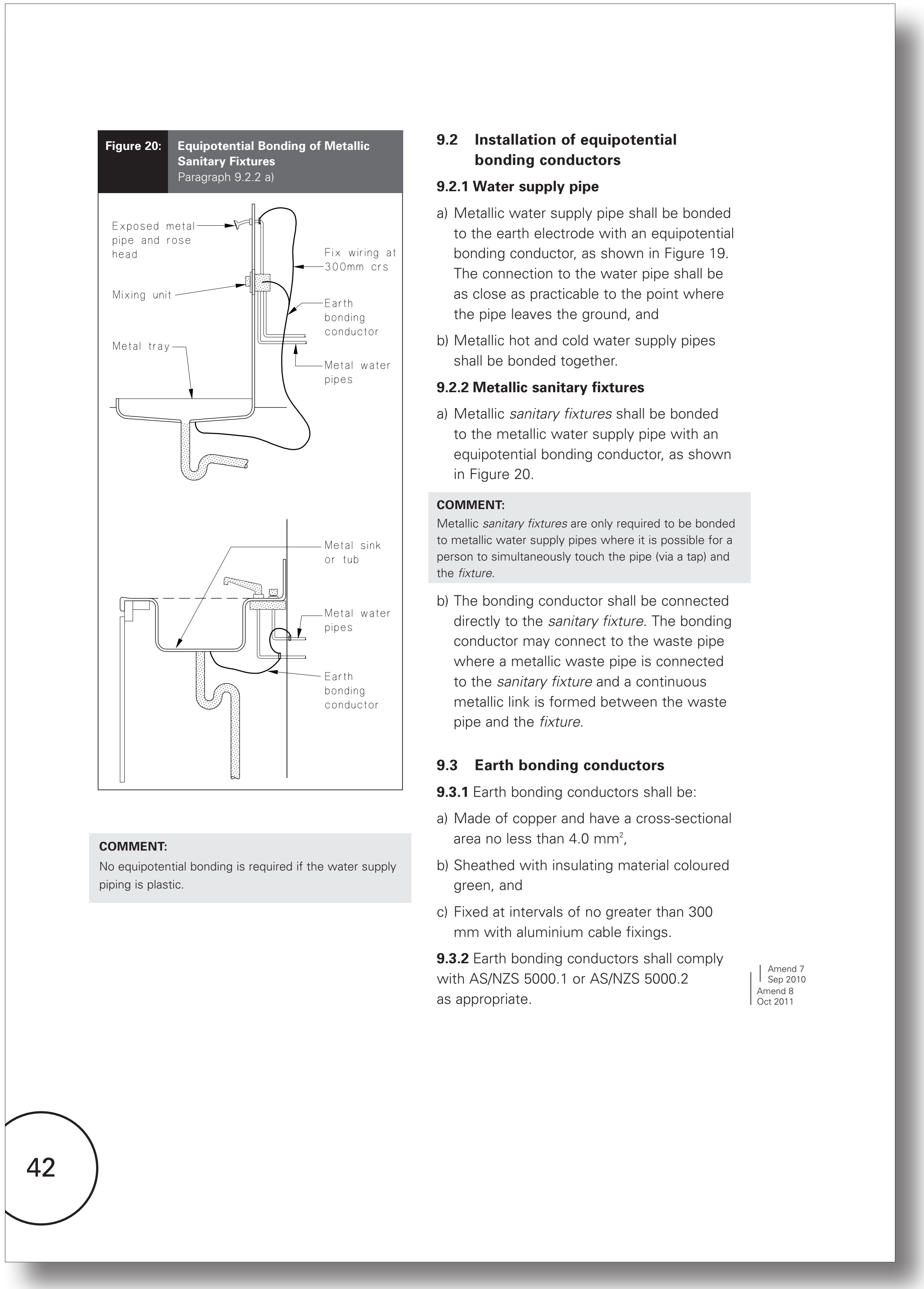

Figure 20: **Equipotential Bonding of Metallic Sanitary Fixtures**
Paragraph 9.2.2 a)

COMMENT:
No equipotential bonding is required if the water supply piping is plastic.

9.2 Installation of equipotential bonding conductors

9.2.1 Water supply pipe

a) Metallic water supply pipe shall be bonded to the earth electrode with an equipotential bonding conductor, as shown in Figure 19. The connection to the water pipe shall be as close as practicable to the point where the pipe leaves the ground, and

b) Metallic hot and cold water supply pipes shall be bonded together.

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COMMENT:
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b) The bonding conductor shall be connected directly to the *sanitary fixture*. The bonding conductor may connect to the waste pipe where a metallic waste pipe is connected to the *sanitary fixture* and a continuous metallic link is formed between the waste pipe and the *fixture*.

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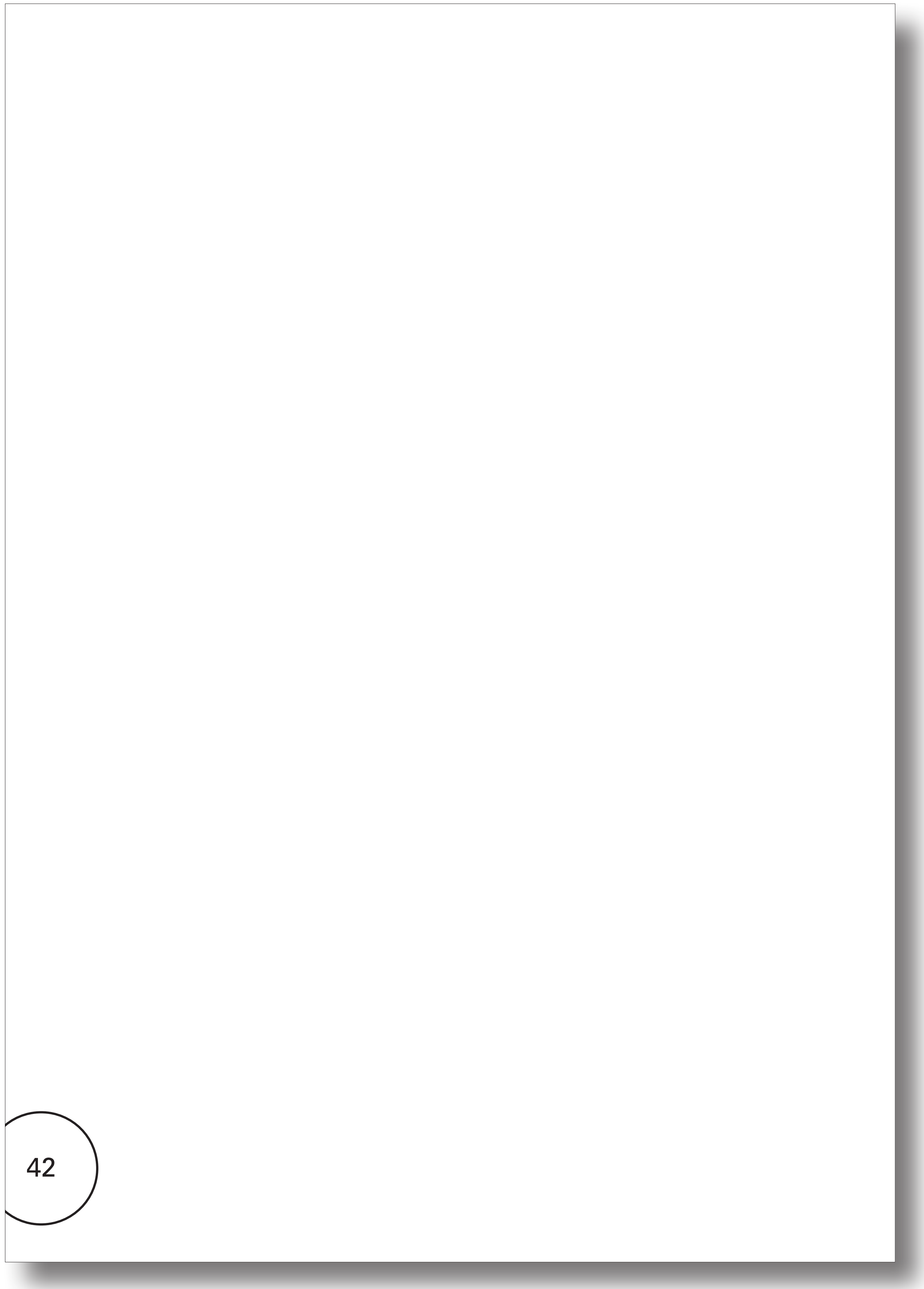
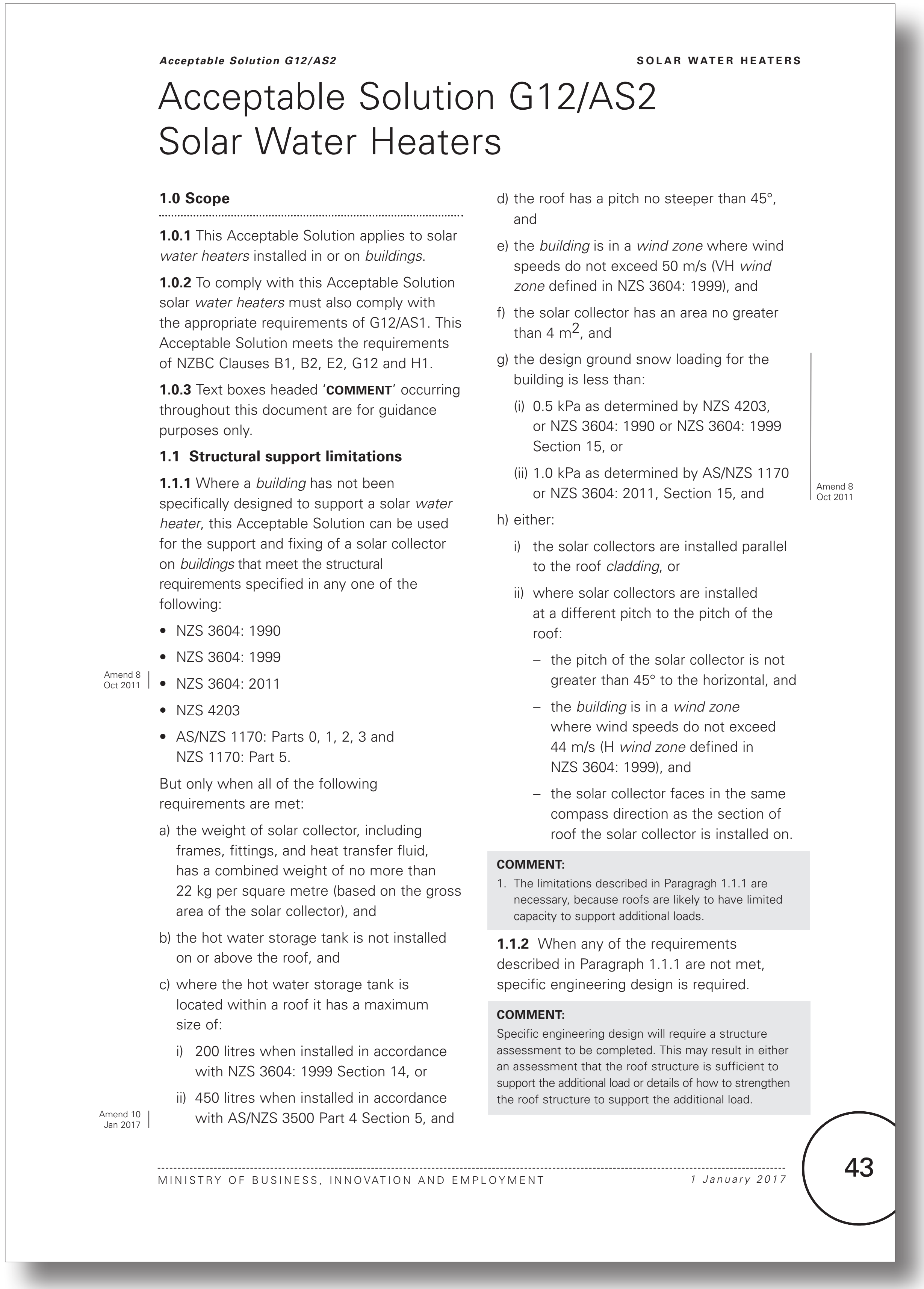
Amend 7 Sep 2010
Amend 8 Oct 2011

Current G12 Water Supplies acceptable solutions and verification methods (Text to be amended shown in red)



Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)

Current G12 Water Supplies - No changes proposed to this page



Acceptable Solution G12/AS2
Solar Water Heaters

1.0 Scope

1.0.1 This Acceptable Solution applies to solar *water heaters* installed in or on *buildings*.

1.0.2 To comply with this Acceptable Solution solar *water heaters* must also comply with the appropriate requirements of G12/AS1. This Acceptable Solution meets the requirements of NZBC Clauses B1, B2, E2, G12 and H1.

1.0.3 Text boxes headed '**COMMENT**' occurring throughout this document are for guidance purposes only.

1.1 Structural support limitations

1.1.1 Where a *building* has not been specifically designed to support a solar *water heater*, this Acceptable Solution can be used for the support and fixing of a solar collector on *buildings* that meet the structural requirements specified in any one of the following:

- NZS 3604: 1990
- NZS 3604: 1999
- NZS 3604: 2011 Amend 8 Oct 2011
- NZS 4203
- AS/NZS 1170: Parts 0, 1, 2, 3 and NZS 1170: Part 5.

But only when all of the following requirements are met:

a) the weight of solar collector, including frames, fittings, and heat transfer fluid, has a combined weight of no more than 22 kg per square metre (based on the gross area of the solar collector), and

b) the hot water storage tank is not installed on or above the roof, and

c) where the hot water storage tank is located within a roof it has a maximum size of:

   i) 200 litres when installed in accordance with NZS 3604: 1999 Section 14, or

   ii) 450 litres when installed in accordance with AS/NZS 3500 Part 4 Section 5, and Amend 10 Jan 2017

d) the roof has a pitch no steeper than 45°, and

e) the *building* is in a *wind zone* where wind speeds do not exceed 50 m/s (VH *wind zone* defined in NZS 3604: 1999), and

f) the solar collector has an area no greater than 4 m^2, and

g) the design ground snow loading for the building is less than:

   (i) 0.5 kPa as determined by NZS 4203, or NZS 3604: 1990 or NZS 3604: 1999 Section 15, or

   (ii) 1.0 kPa as determined by AS/NZS 1170 or NZS 3604: 2011, Section 15, and Amend 8 Oct 2011

h) either:

   i) the solar collectors are installed parallel to the roof *cladding*, or

   ii) where solar collectors are installed at a different pitch to the pitch of the roof:

      – the pitch of the solar collector is not greater than 45° to the horizontal, and

      – the *building* is in a *wind zone* where wind speeds do not exceed 44 m/s (H *wind zone* defined in NZS 3604: 1999), and

      – the solar collector faces in the same compass direction as the section of roof the solar collector is installed on.

COMMENT:

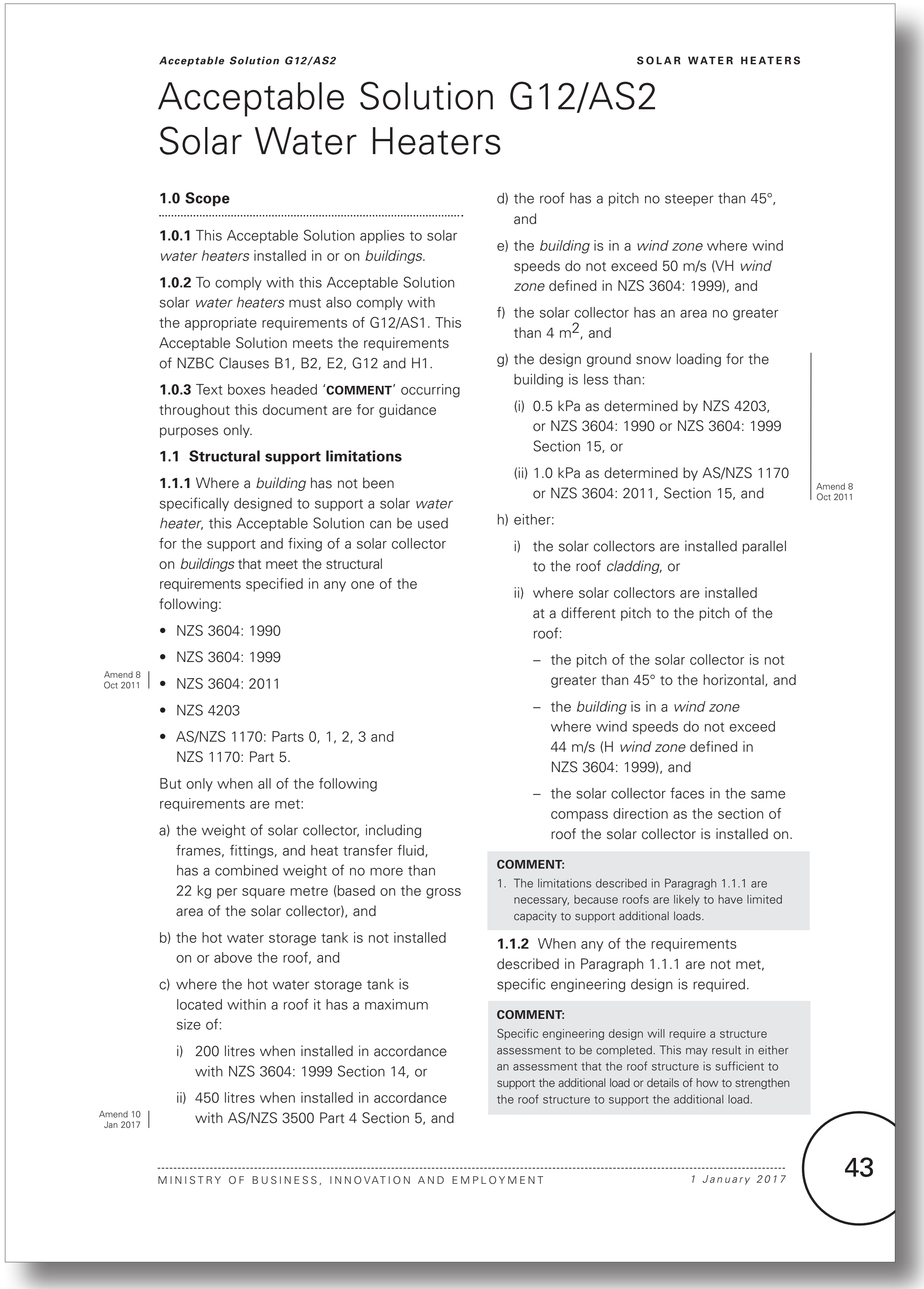
1. The limitations described in Paragraph 1.1.1 are necessary, because roofs are likely to have limited capacity to support additional loads.

1.1.2 When any of the requirements described in Paragraph 1.1.1 are not met, specific engineering design is required.

COMMENT:

Specific engineering design will require a structure assessment to be completed. This may result in either an assessment that the roof structure is sufficient to support the additional load or details of how to strengthen the roof structure to support the additional load.

Proposed G12 Water Supplies - No changes proposed to this page



Acceptable Solution G12/AS2 SOLAR WATER HEATERS

Acceptable Solution G12/AS2
Solar Water Heaters

1.0 Scope

1.0.1 This Acceptable Solution applies to solar *water heaters* installed in or on *buildings*.

1.0.2 To comply with this Acceptable Solution solar *water heaters* must also comply with the appropriate requirements of G12/AS1. This Acceptable Solution meets the requirements of NZBC Clauses B1, B2, E2, G12 and H1.

1.0.3 Text boxes headed '**COMMENT**' occurring throughout this document are for guidance purposes only.

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- NZS 3604: 1990
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- NZS 3604: 2011 Amend 8 Oct 2011
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But only when all of the following requirements are met:

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b) the hot water storage tank is not installed on or above the roof, and

c) where the hot water storage tank is located within a roof it has a maximum size of:

   i) 200 litres when installed in accordance with NZS 3604: 1999 Section 14, or

   ii) 450 litres when installed in accordance with AS/NZS 3500 Part 4 Section 5, and Amend 10 Jan 2017

d) the roof has a pitch no steeper than 45°, and

e) the *building* is in a *wind zone* where wind speeds do not exceed 50 m/s (VH *wind zone* defined in NZS 3604: 1999), and

f) the solar collector has an area no greater than 4 m^2, and

g) the design ground snow loading for the building is less than:

   (i) 0.5 kPa as determined by NZS 4203, or NZS 3604: 1990 or NZS 3604: 1999 Section 15, or

   (ii) 1.0 kPa as determined by AS/NZS 1170 or NZS 3604: 2011, Section 15, and Amend 8 Oct 2011

h) either:

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   ii) where solar collectors are installed at a different pitch to the pitch of the roof:

      – the pitch of the solar collector is not greater than 45° to the horizontal, and

      – the *building* is in a *wind zone* where wind speeds do not exceed 44 m/s (H *wind zone* defined in NZS 3604: 1999), and

      – the solar collector faces in the same compass direction as the section of roof the solar collector is installed on.

COMMENT:

1. The limitations described in Paragraph 1.1.1 are necessary, because roofs are likely to have limited capacity to support additional loads.

1.1.2 When any of the requirements described in Paragraph 1.1.1 are not met, specific engineering design is required.

COMMENT:

Specific engineering design will require a structure assessment to be completed. This may result in either an assessment that the roof structure is sufficient to support the additional load or details of how to strengthen the roof structure to support the additional load.

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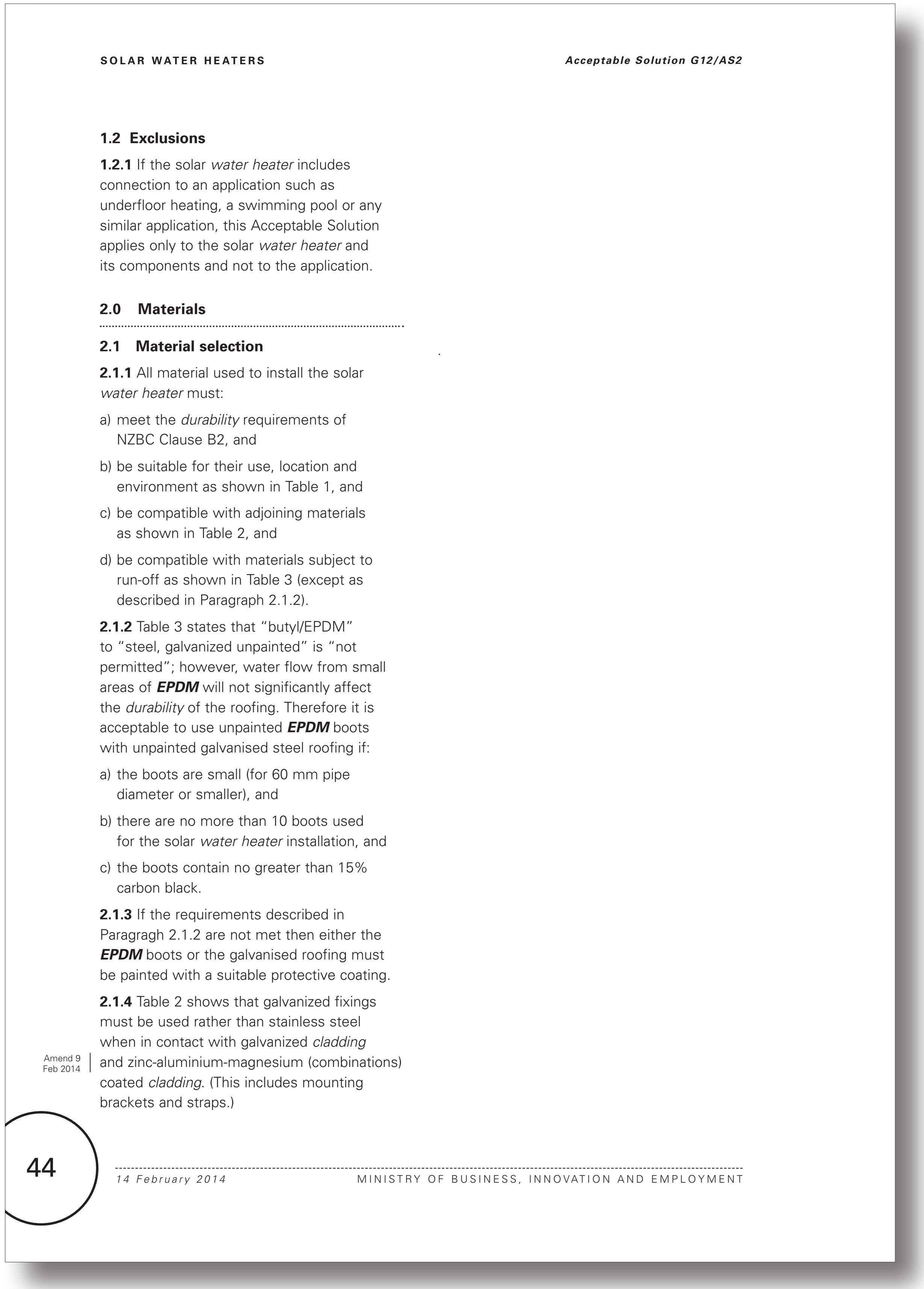
MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT 1 January 2017

Current G12 Water Supplies - No changes proposed to this page



1.2 Exclusions

1.2.1 If the solar *water heater* includes connection to an application such as underfloor heating, a swimming pool or any similar application, this Acceptable Solution applies only to the solar *water heater* and its components and not to the application.

2.0 Materials

2.1 Material selection

2.1.1 All material used to install the solar *water heater* must:

a) meet the *durability* requirements of NZBC Clause B2, and

b) be suitable for their use, location and environment as shown in Table 1, and

c) be compatible with adjoining materials as shown in Table 2, and

d) be compatible with materials subject to run-off as shown in Table 3 (except as described in Paragraph 2.1.2).

2.1.2 Table 3 states that "butyl/EPDM" to "steel, galvanized unpainted" is "not permitted"; however, water flow from small areas of ***EPDM*** will not significantly affect the *durability* of the roofing. Therefore it is acceptable to use unpainted ***EPDM*** boots with unpainted galvanised steel roofing if:

a) the boots are small (for 60 mm pipe diameter or smaller), and

b) there are no more than 10 boots used for the solar *water heater* installation, and

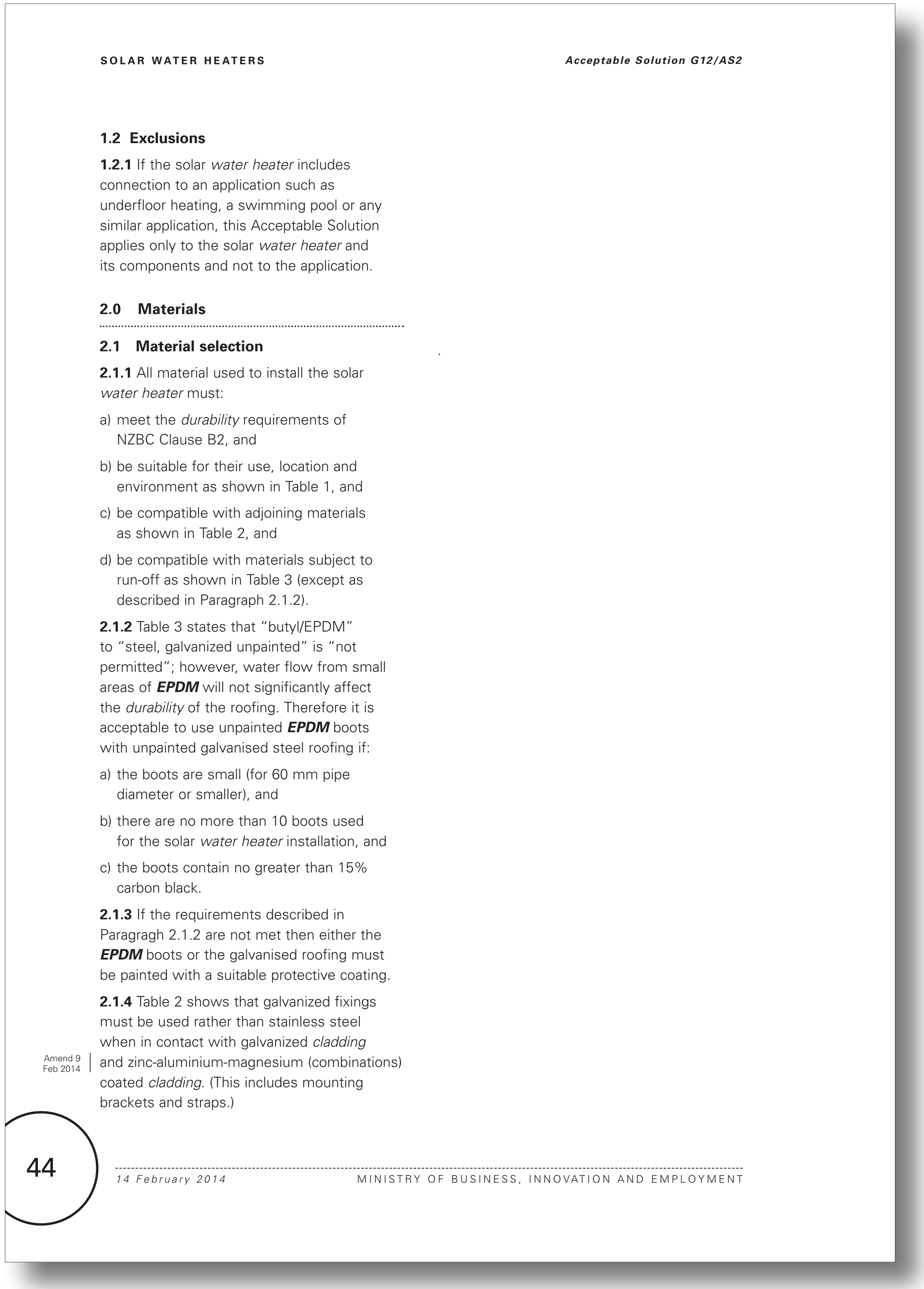
c) the boots contain no greater than 15% carbon black.

2.1.3 If the requirements described in Paragragh 2.1.2 are not met then either the ***EPDM*** boots or the galvanised roofing must be painted with a suitable protective coating.

2.1.4 Table 2 shows that galvanized fixings must be used rather than stainless steel when in contact with galvanized *cladding* and zinc-aluminium-magnesium (combinations) coated *cladding*. (This includes mounting brackets and straps.)

Amend 9 Feb 2014

Proposed G12 Water Supplies - No changes proposed to this page



SOLAR WATER HEATERS Acceptable Solution G12/AS2

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2.0 Materials

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b) be suitable for their use, location and environment as shown in Table 1, and

c) be compatible with adjoining materials as shown in Table 2, and

d) be compatible with materials subject to run-off as shown in Table 3 (except as described in Paragraph 2.1.2).

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a) the boots are small (for 60 mm pipe diameter or smaller), and

b) there are no more than 10 boots used for the solar *water heater* installation, and

c) the boots contain no greater than 15% carbon black.

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2.1.4 Table 2 shows that galvanized fixings must be used rather than stainless steel when in contact with galvanized *cladding* and zinc-aluminium-magnesium (combinations) coated *cladding*. (This includes mounting brackets and straps.)

Amend 9 Feb 2014

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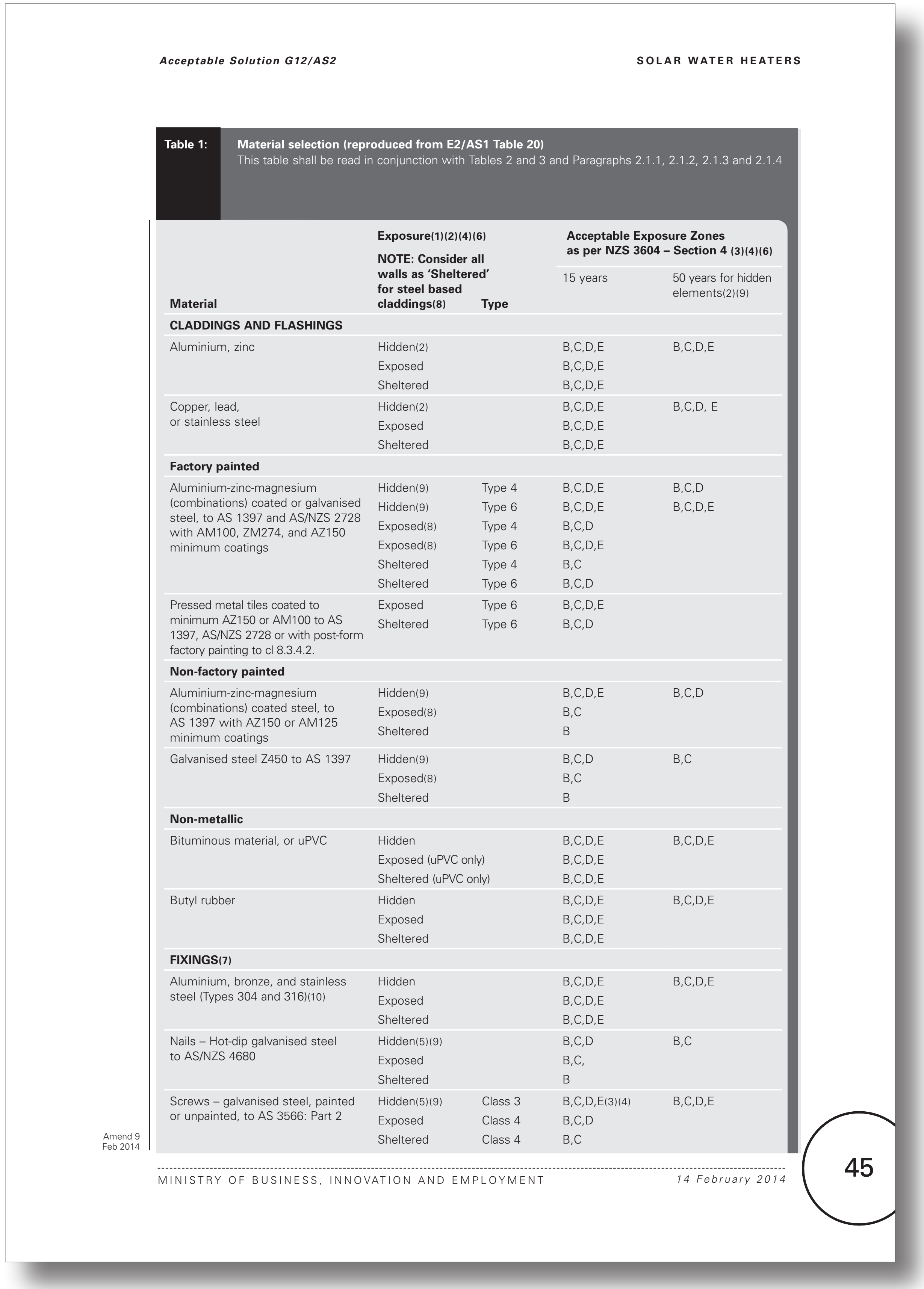
Current G12 Water Supplies - No changes proposed to this page



Acceptable Solution G12/AS2 SOLAR WATER HEATERS

Table 1: **Material selection (reproduced from E2/AS1 Table 20)**
This table shall be read in conjunction with Tables 2 and 3 and Paragraphs 2.1.1, 2.1.2, 2.1.3 and 2.1.4

Material	**Exposure(1)(2)(4)(6)** **NOTE: Consider all walls as 'Sheltered' for steel based claddings(8)**	**Type**	**Acceptable Exposure Zones as per NZS 3604 – Section 4 (3)(4)(6)**	
			15 years	50 years for hidden elements(2)(9)
CLADDINGS AND FLASHINGS				
Aluminium, zinc	Hidden(2)		B,C,D,E	B,C,D,E
	Exposed		B,C,D,E	
	Sheltered		B,C,D,E	
Copper, lead, or stainless steel	Hidden(2)		B,C,D,E	B,C,D, E
	Exposed		B,C,D,E	
	Sheltered		B,C,D,E	
Factory painted				
Aluminium-zinc-magnesium (combinations) coated or galvanised steel, to AS 1397 and AS/NZS 2728 with AM100, ZM274, and AZ150 minimum coatings	Hidden(9)	Type 4	B,C,D,E	B,C,D
	Hidden(9)	Type 6	B,C,D,E	B,C,D,E
	Exposed(8)	Type 4	B,C,D	
	Exposed(8)	Type 6	B,C,D,E	
	Sheltered	Type 4	B,C	
	Sheltered	Type 6	B,C,D	
Pressed metal tiles coated to minimum AZ150 or AM100 to AS 1397, AS/NZS 2728 or with post-form factory painting to cl 8.3.4.2.	Exposed	Type 6	B,C,D,E	
	Sheltered	Type 6	B,C,D	
Non-factory painted				
Aluminium-zinc-magnesium (combinations) coated steel, to AS 1397 with AZ150 or AM125 minimum coatings	Hidden(9)		B,C,D,E	B,C,D
	Exposed(8)		B,C	
	Sheltered		B	
Galvanised steel Z450 to AS 1397	Hidden(9)		B,C,D	B,C
	Exposed(8)		B,C	
	Sheltered		B	
Non-metallic				
Bituminous material, or uPVC	Hidden		B,C,D,E	B,C,D,E
	Exposed (uPVC only)		B,C,D,E	
	Sheltered (uPVC only)		B,C,D,E	
Butyl rubber	Hidden		B,C,D,E	B,C,D,E
	Exposed		B,C,D,E	
	Sheltered		B,C,D,E	
FIXINGS(7)				
Aluminium, bronze, and stainless steel (Types 304 and 316)(10)	Hidden		B,C,D,E	B,C,D,E
	Exposed		B,C,D,E	
	Sheltered		B,C,D,E	
Nails – Hot-dip galvanised steel to AS/NZS 4680	Hidden(5)(9)		B,C,D	B,C
	Exposed		B,C,	
	Sheltered		B	
Screws – galvanised steel, painted or unpainted, to AS 3566: Part 2	Hidden(5)(9)	Class 3	B,C,D,E(3)(4)	B,C,D,E
	Exposed	Class 4	B,C,D	
	Sheltered	Class 4	B,C	

Amend 9
Feb 2014

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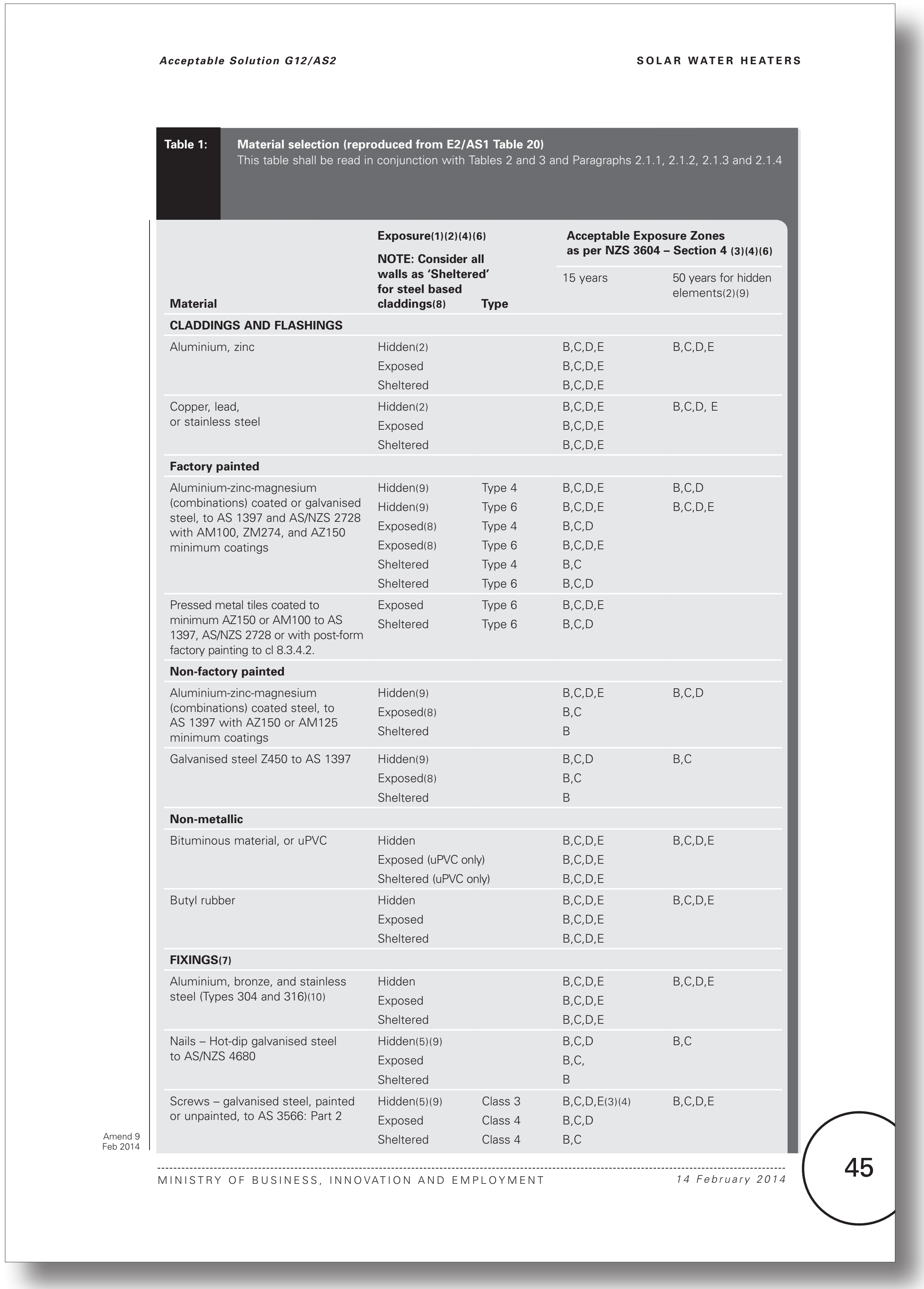
Proposed G12 Water Supplies - No changes proposed to this page



Acceptable Solution G12/AS2 SOLAR WATER HEATERS

Table 1: **Material selection (reproduced from E2/AS1 Table 20)**
This table shall be read in conjunction with Tables 2 and 3 and Paragraphs 2.1.1, 2.1.2, 2.1.3 and 2.1.4

Material	**Exposure(1)(2)(4)(6)** **NOTE: Consider all walls as 'Sheltered' for steel based claddings(8)**	**Type**	**Acceptable Exposure Zones as per NZS 3604 – Section 4 (3)(4)(6)**	
			15 years	50 years for hidden elements(2)(9)
CLADDINGS AND FLASHINGS				
Aluminium, zinc	Hidden(2)		B,C,D,E	B,C,D,E
	Exposed		B,C,D,E	
	Sheltered		B,C,D,E	
Copper, lead, or stainless steel	Hidden(2)		B,C,D,E	B,C,D, E
	Exposed		B,C,D,E	
	Sheltered		B,C,D,E	
Factory painted				
Aluminium-zinc-magnesium (combinations) coated or galvanised steel, to AS 1397 and AS/NZS 2728 with AM100, ZM274, and AZ150 minimum coatings	Hidden(9)	Type 4	B,C,D,E	B,C,D
	Hidden(9)	Type 6	B,C,D,E	B,C,D,E
	Exposed(8)	Type 4	B,C,D	
	Exposed(8)	Type 6	B,C,D,E	
	Sheltered	Type 4	B,C	
	Sheltered	Type 6	B,C,D	
Pressed metal tiles coated to minimum AZ150 or AM100 to AS 1397, AS/NZS 2728 or with post-form factory painting to cl 8.3.4.2.	Exposed	Type 6	B,C,D,E	
	Sheltered	Type 6	B,C,D	
Non-factory painted				
Aluminium-zinc-magnesium (combinations) coated steel, to AS 1397 with AZ150 or AM125 minimum coatings	Hidden(9)		B,C,D,E	B,C,D
	Exposed(8)		B,C	
	Sheltered		B	
Galvanised steel Z450 to AS 1397	Hidden(9)		B,C,D	B,C
	Exposed(8)		B,C	
	Sheltered		B	
Non-metallic				
Bituminous material, or uPVC	Hidden		B,C,D,E	B,C,D,E
	Exposed (uPVC only)		B,C,D,E	
	Sheltered (uPVC only)		B,C,D,E	
Butyl rubber	Hidden		B,C,D,E	B,C,D,E
	Exposed		B,C,D,E	
	Sheltered		B,C,D,E	
FIXINGS(7)				
Aluminium, bronze, and stainless steel (Types 304 and 316)(10)	Hidden		B,C,D,E	B,C,D,E
	Exposed		B,C,D,E	
	Sheltered		B,C,D,E	
Nails – Hot-dip galvanised steel to AS/NZS 4680	Hidden(5)(9)		B,C,D	B,C
	Exposed		B,C,	
	Sheltered		B	
Screws – galvanised steel, painted or unpainted, to AS 3566: Part 2	Hidden(5)(9)	Class 3	B,C,D,E(3)(4)	B,C,D,E
	Exposed	Class 4	B,C,D	
	Sheltered	Class 4	B,C	

Amend 9
Feb 2014

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT *14 February 2014*

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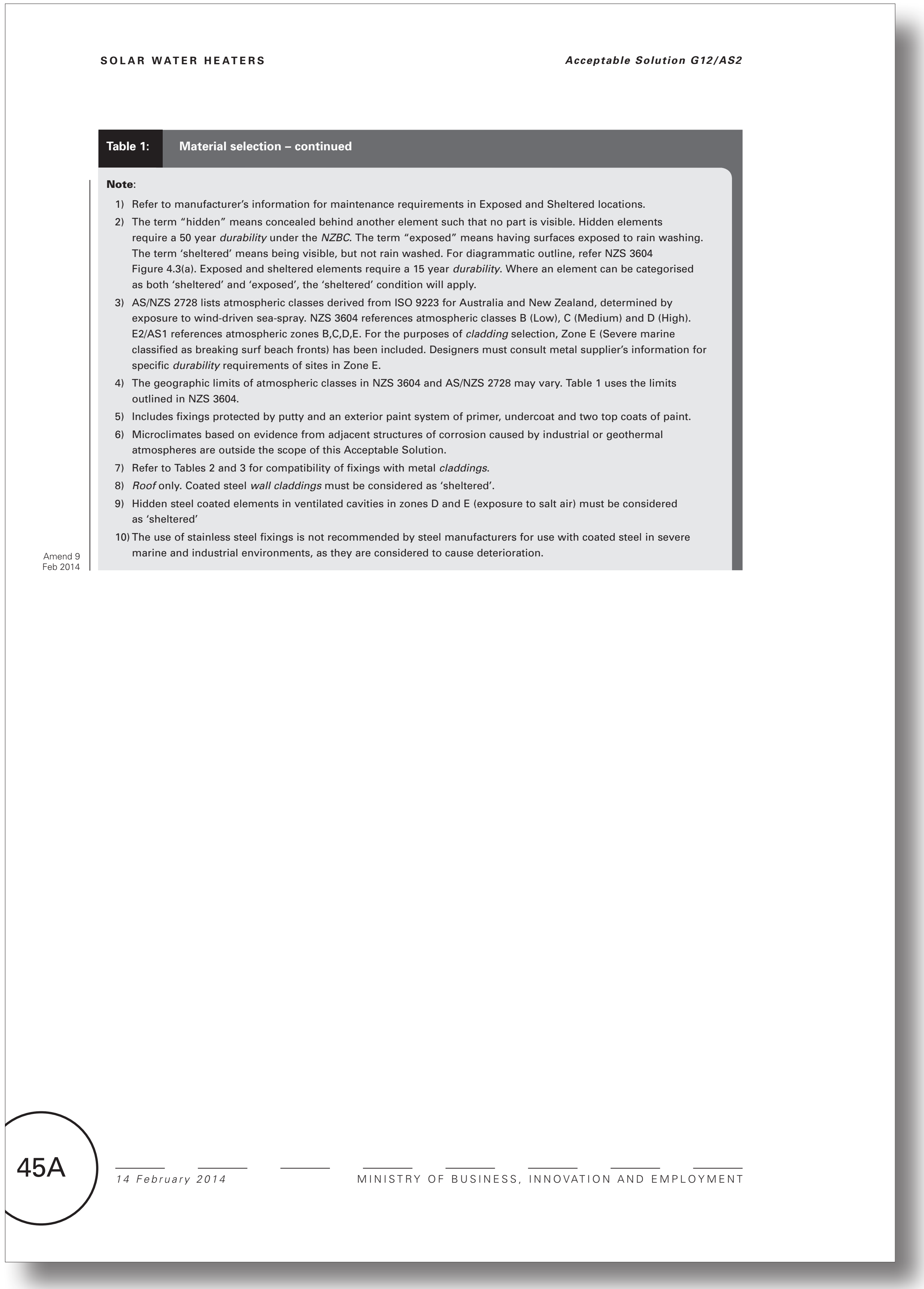
Current G12 Water Supplies - No changes proposed to this page



SOLAR WATER HEATERS *Acceptable Solution G12/AS2*

Table 1: Material selection – continued

Note:

1) Refer to manufacturer's information for maintenance requirements in Exposed and Sheltered locations.
2) The term "hidden" means concealed behind another element such that no part is visible. Hidden elements require a 50 year *durability* under the *NZBC*. The term "exposed" means having surfaces exposed to rain washing. The term 'sheltered' means being visible, but not rain washed. For diagrammatic outline, refer NZS 3604 Figure 4.3(a). Exposed and sheltered elements require a 15 year *durability*. Where an element can be categorised as both 'sheltered' and 'exposed', the 'sheltered' condition will apply.
3) AS/NZS 2728 lists atmospheric classes derived from ISO 9223 for Australia and New Zealand, determined by exposure to wind-driven sea-spray. NZS 3604 references atmospheric classes B (Low), C (Medium) and D (High). E2/AS1 references atmospheric zones B,C,D,E. For the purposes of *cladding* selection, Zone E (Severe marine classified as breaking surf beach fronts) has been included. Designers must consult metal supplier's information for specific *durability* requirements of sites in Zone E.
4) The geographic limits of atmospheric classes in NZS 3604 and AS/NZS 2728 may vary. Table 1 uses the limits outlined in NZS 3604.
5) Includes fixings protected by putty and an exterior paint system of primer, undercoat and two top coats of paint.
6) Microclimates based on evidence from adjacent structures of corrosion caused by industrial or geothermal atmospheres are outside the scope of this Acceptable Solution.
7) Refer to Tables 2 and 3 for compatibility of fixings with metal *claddings*.
8) *Roof* only. Coated steel *wall claddings* must be considered as 'sheltered'.
9) Hidden steel coated elements in ventilated cavities in zones D and E (exposure to salt air) must be considered as 'sheltered'
10) The use of stainless steel fixings is not recommended by steel manufacturers for use with coated steel in severe marine and industrial environments, as they are considered to cause deterioration.

Amend 9
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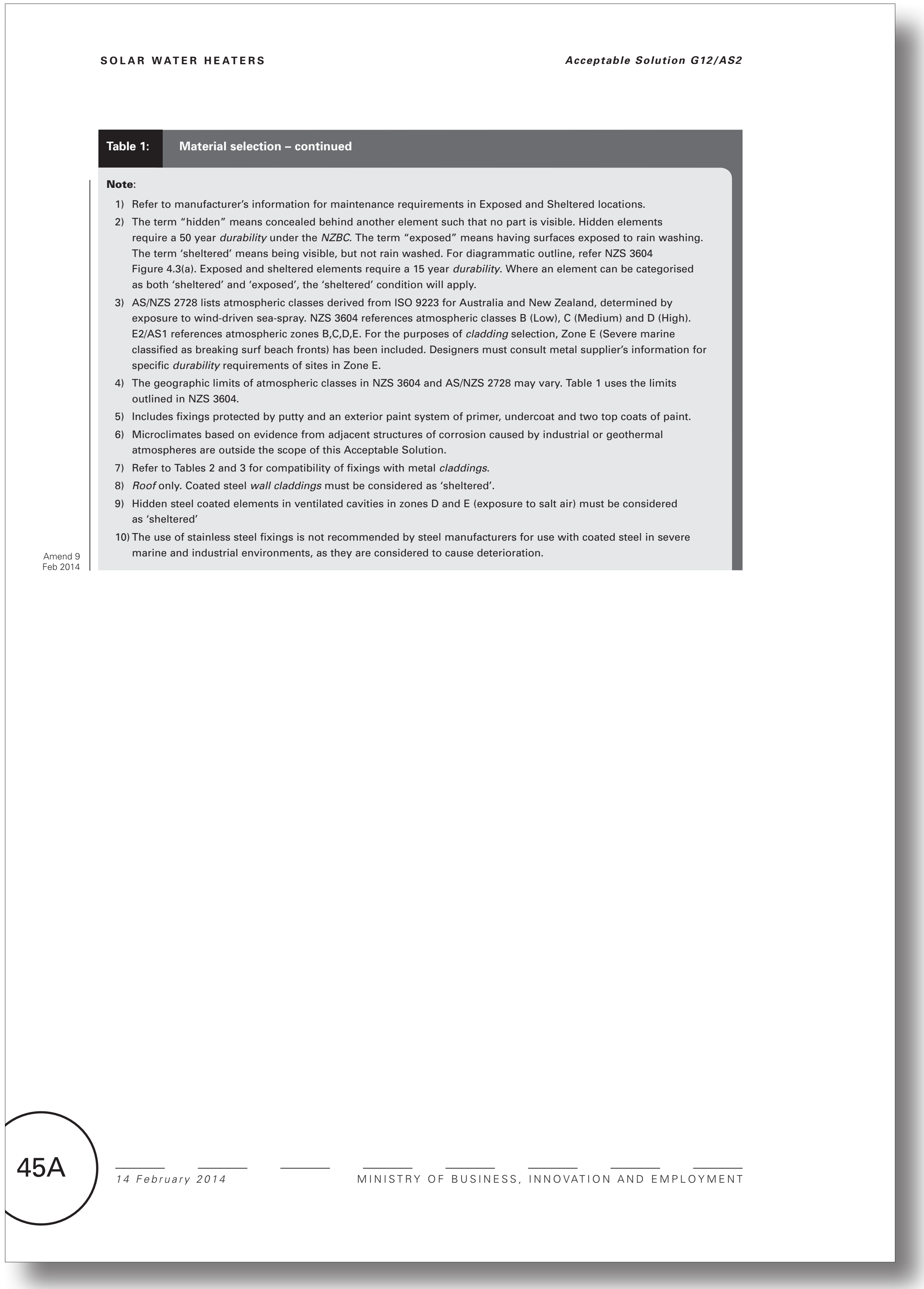

SOLAR WATER HEATERS *Acceptable Solution G12/AS2*

Table 1: Material selection – continued

Note:

1) Refer to manufacturer's information for maintenance requirements in Exposed and Sheltered locations.
2) The term "hidden" means concealed behind another element such that no part is visible. Hidden elements require a 50 year *durability* under the *NZBC*. The term "exposed" means having surfaces exposed to rain washing. The term 'sheltered' means being visible, but not rain washed. For diagrammatic outline, refer NZS 3604 Figure 4.3(a). Exposed and sheltered elements require a 15 year *durability*. Where an element can be categorised as both 'sheltered' and 'exposed', the 'sheltered' condition will apply.
3) AS/NZS 2728 lists atmospheric classes derived from ISO 9223 for Australia and New Zealand, determined by exposure to wind-driven sea-spray. NZS 3604 references atmospheric classes B (Low), C (Medium) and D (High). E2/AS1 references atmospheric zones B,C,D,E. For the purposes of *cladding* selection, Zone E (Severe marine classified as breaking surf beach fronts) has been included. Designers must consult metal supplier's information for specific *durability* requirements of sites in Zone E.
4) The geographic limits of atmospheric classes in NZS 3604 and AS/NZS 2728 may vary. Table 1 uses the limits outlined in NZS 3604.
5) Includes fixings protected by putty and an exterior paint system of primer, undercoat and two top coats of paint.
6) Microclimates based on evidence from adjacent structures of corrosion caused by industrial or geothermal atmospheres are outside the scope of this Acceptable Solution.
7) Refer to Tables 2 and 3 for compatibility of fixings with metal *claddings*.
8) *Roof* only. Coated steel *wall claddings* must be considered as 'sheltered'.
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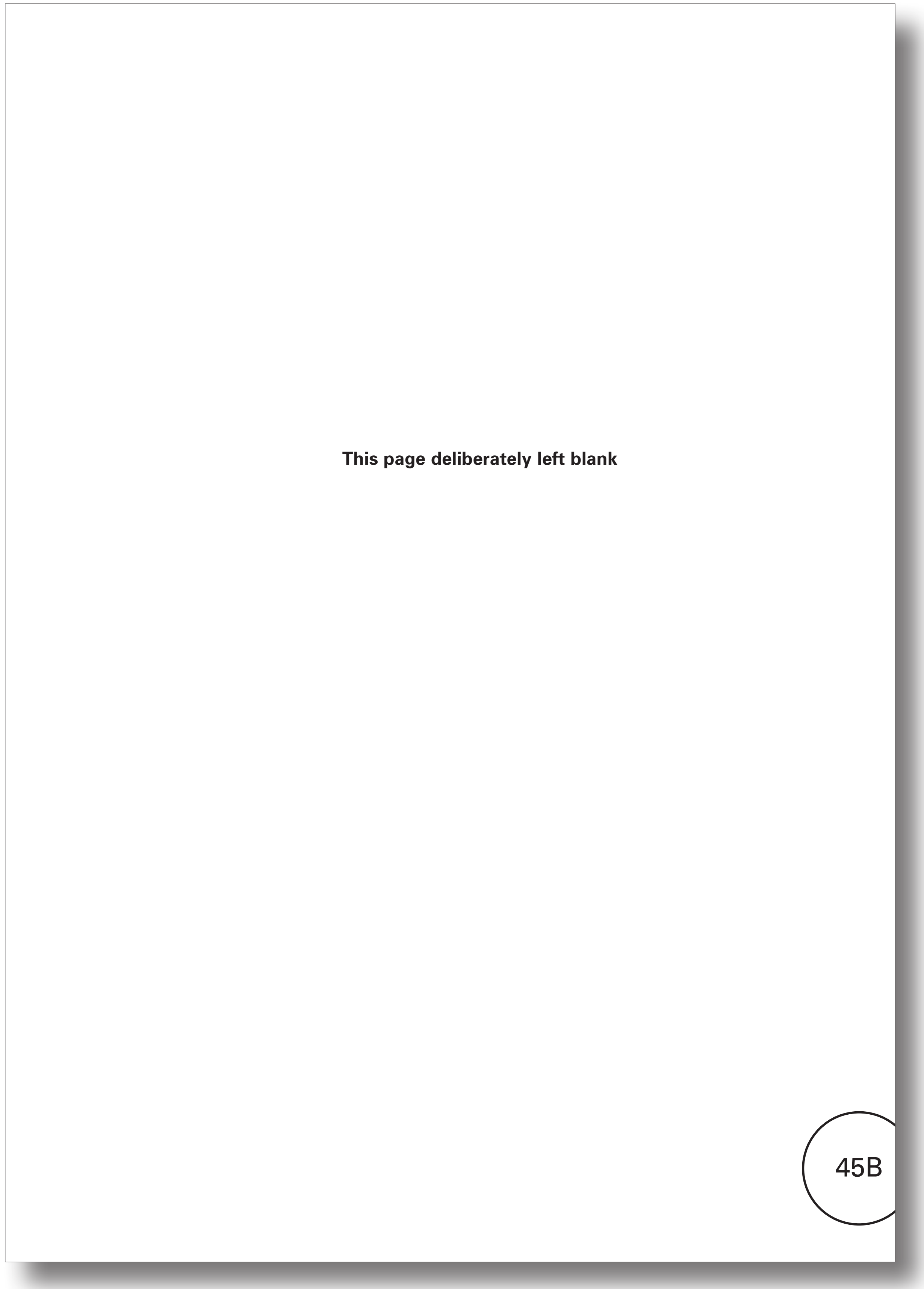

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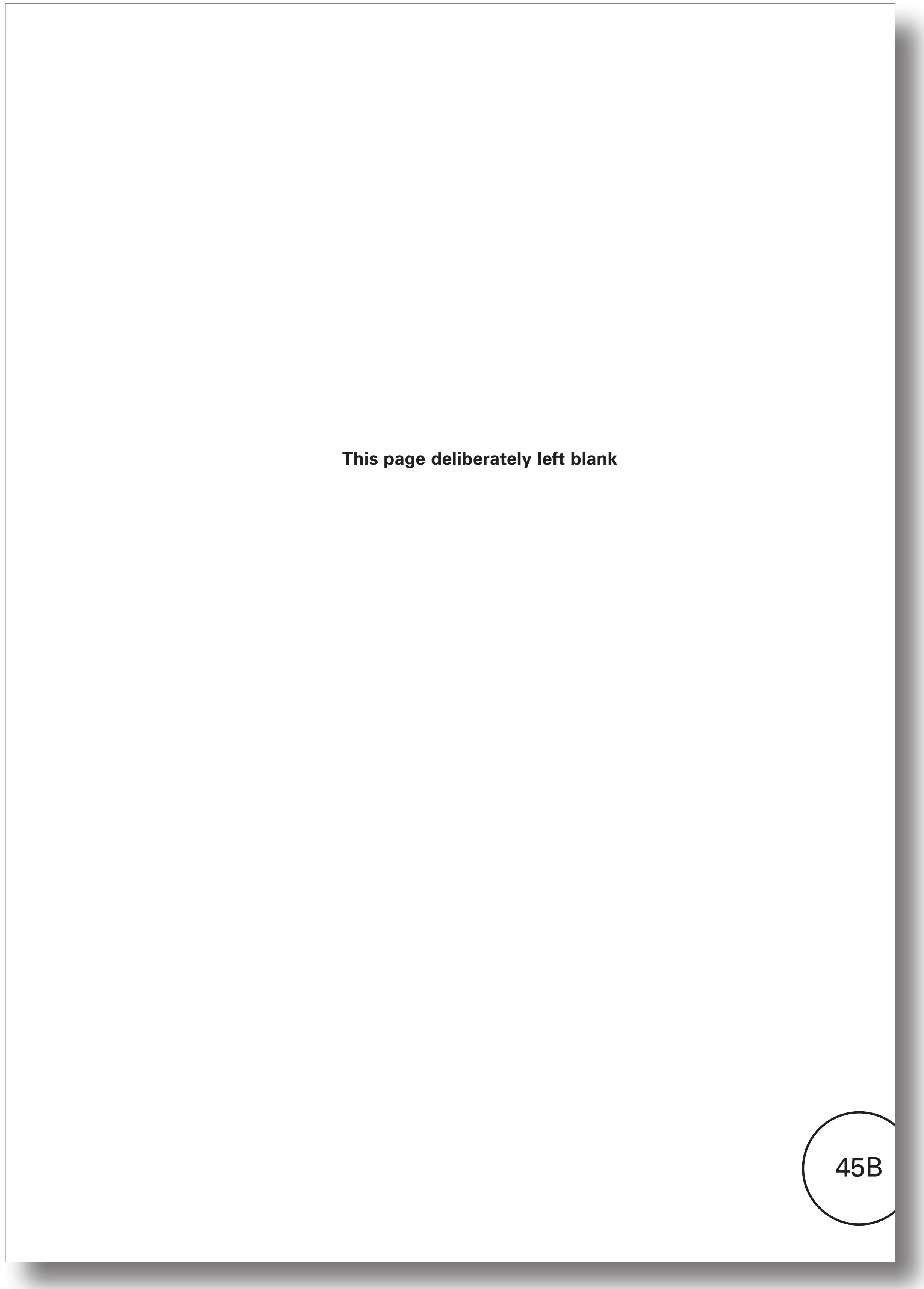

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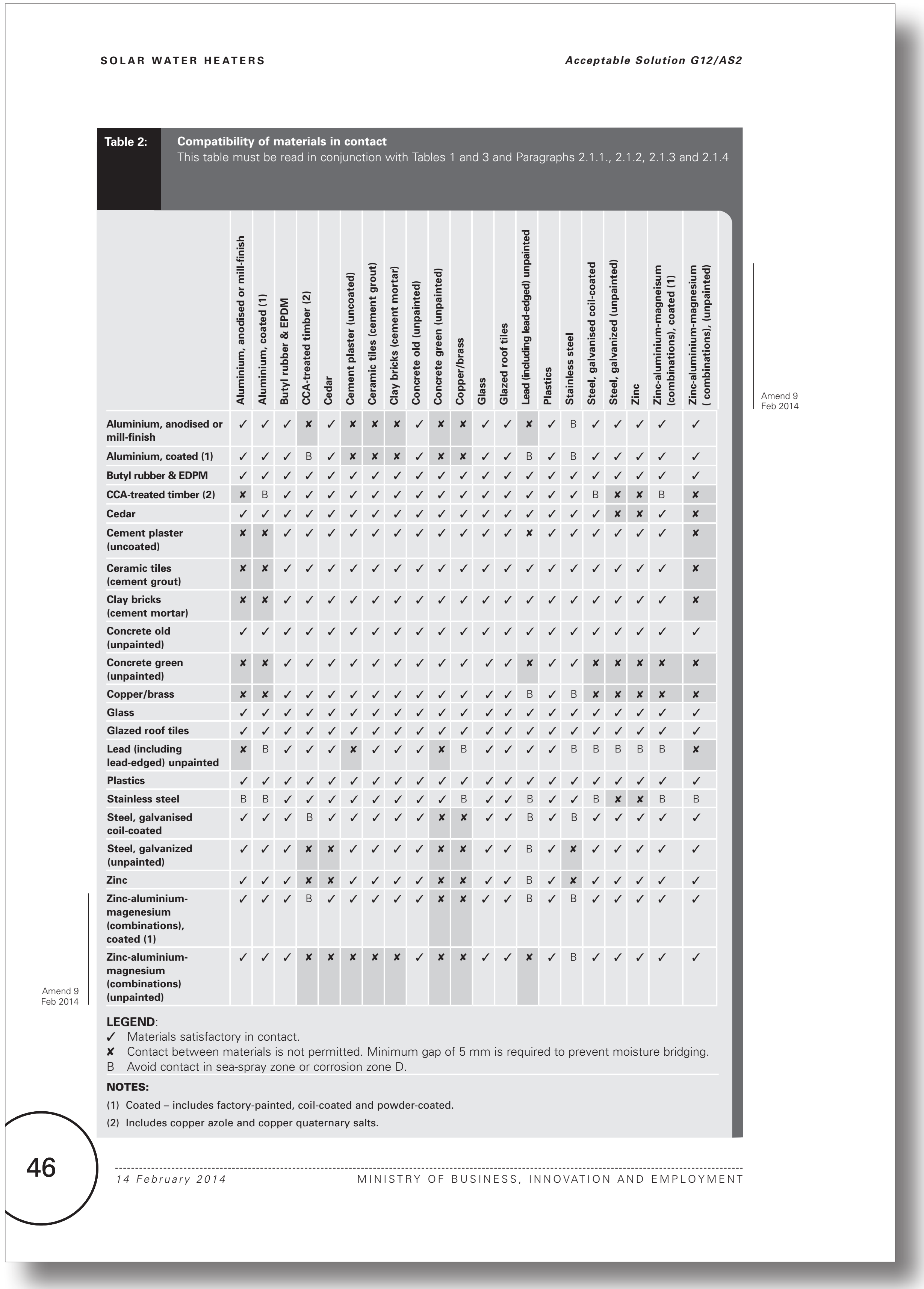

Table 2: **Compatibility of materials in contact**
This table must be read in conjunction with Tables 1 and 3 and Paragraphs 2.1.1., 2.1.2, 2.1.3 and 2.1.4

	Aluminium, anodised or mill-finish	Aluminium, coated (1)	Butyl rubber & EPDM	CCA-treated timber (2)	Cedar	Cement plaster (uncoated)	Ceramic tiles (cement grout)	Clay bricks (cement mortar)	Concrete old (unpainted)	Concrete green (unpainted)	Copper/brass	Glass	Glazed roof tiles	Lead (including lead-edged) unpainted	Plastics	Stainless steel	Steel, galvanised coil-coated	Steel, galvanized (unpainted)	Zinc	Zinc-aluminium-magneisum (combinations), coated (1)	Zinc-aluminium-magnesium (combinations), (unpainted)
Aluminium, anodised or mill-finish	✓	✓	✓	✘	✓	✘	✘	✘	✓	✘	✘	✓	✓	✘	✓	B	✓	✓	✓	✓	✓
Aluminium, coated (1)	✓	✓	✓	B	✓	✘	✘	✘	✓	✘	✘	✓	✓	B	✓	B	✓	✓	✓	✓	✓
Butyl rubber & EDPM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CCA-treated timber (2)	✘	B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	B	✘	✘	B	✘
Cedar	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✘	✓	✘
Cement plaster (uncoated)	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✓	✓	✓	✓	✓	✓	✘
Ceramic tiles (cement grout)	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘
Clay bricks (cement mortar)	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘
Concrete old (unpainted)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Concrete green (unpainted)	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✓	✓	✘	✘	✘	✘	✘
Copper/brass	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	B	✓	B	✘	✘	✘	✘	✘
Glass	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Glazed roof tiles	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lead (including lead-edged) unpainted	✘	B	✓	✓	✓	✘	✓	✓	✓	✘	B	✓	✓	✓	✓	B	B	B	B	B	✘
Plastics	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stainless steel	B	B	✓	✓	✓	✓	✓	✓	✓	✓	B	✓	✓	B	✓	✓	B	✘	✘	B	B
Steel, galvanised coil-coated	✓	✓	✓	B	✓	✓	✓	✓	✓	✘	✘	✓	✓	B	✓	B	✓	✓	✓	✓	✓
Steel, galvanized (unpainted)	✓	✓	✓	✘	✘	✓	✓	✓	✓	✘	✘	✓	✓	B	✓	✘	✓	✓	✓	✓	✓
Zinc	✓	✓	✓	✘	✘	✓	✓	✓	✓	✘	✘	✓	✓	B	✓	✘	✓	✓	✓	✓	✓
Zinc-aluminium-magenesium (combinations), coated (1)	✓	✓	✓	B	✓	✓	✓	✓	✓	✘	✘	✓	✓	B	✓	B	✓	✓	✓	✓	✓
Zinc-aluminium-magnesium (combinations) (unpainted)	✓	✓	✓	✘	✘	✘	✘	✘	✓	✘	✘	✓	✓	✘	✓	B	✓	✓	✓	✓	✓

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LEGEND:
✓ Materials satisfactory in contact.
✘ Contact between materials is not permitted. Minimum gap of 5 mm is required to prevent moisture bridging.
B Avoid contact in sea-spray zone or corrosion zone D.

NOTES:

(1) Coated – includes factory-painted, coil-coated and powder-coated.

(2) Includes copper azole and copper quaternary salts.

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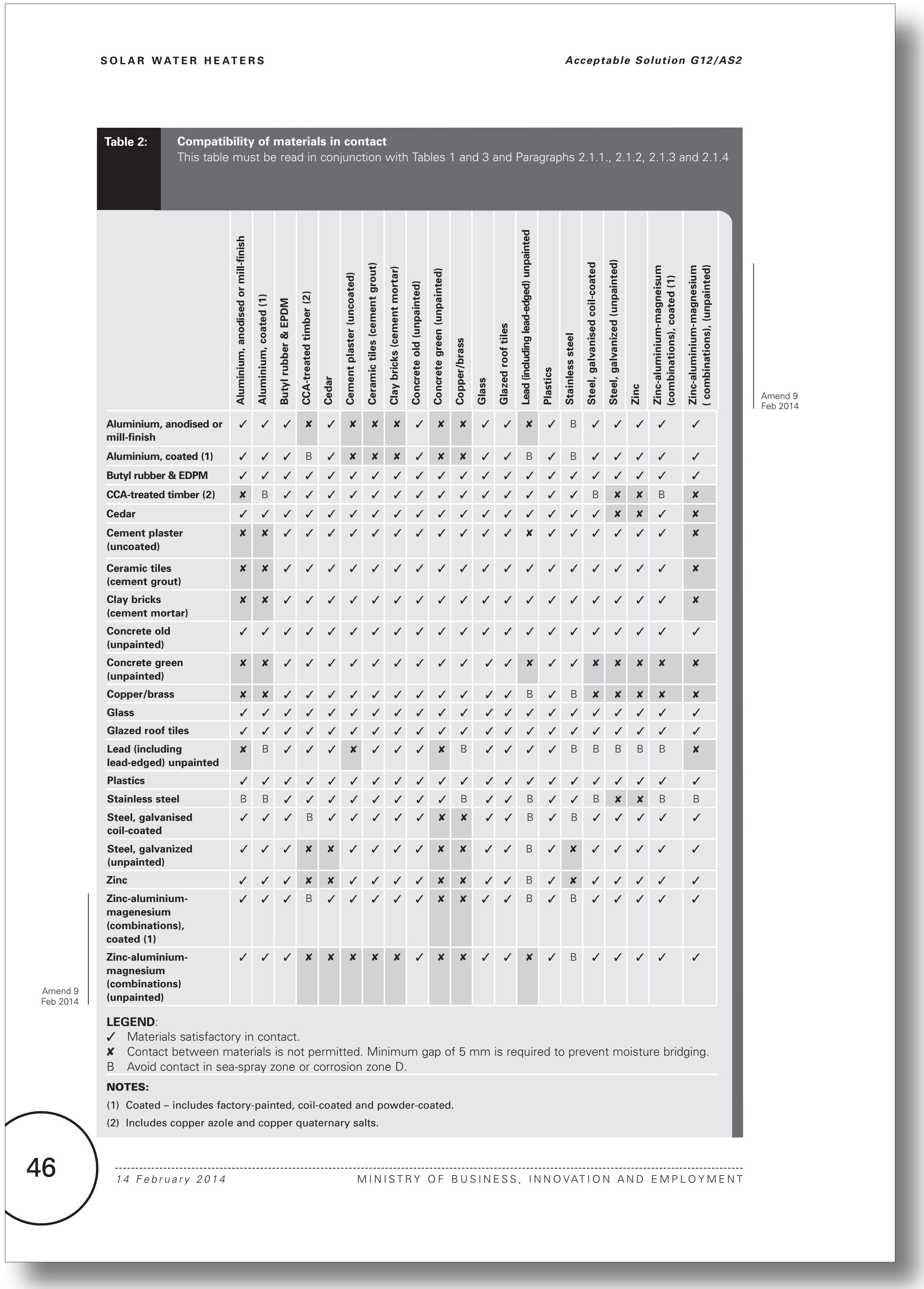

SOLAR WATER HEATERS *Acceptable Solution G12/AS2*

Table 2: **Compatibility of materials in contact**
This table must be read in conjunction with Tables 1 and 3 and Paragraphs 2.1.1., 2.1.2, 2.1.3 and 2.1.4

	Aluminium, anodised or mill-finish	Aluminium, coated (1)	Butyl rubber & EPDM	CCA-treated timber (2)	Cedar	Cement plaster (uncoated)	Ceramic tiles (cement grout)	Clay bricks (cement mortar)	Concrete old (unpainted)	Concrete green (unpainted)	Copper/brass	Glass	Glazed roof tiles	Lead (including lead-edged) unpainted	Plastics	Stainless steel	Steel, galvanised coil-coated	Steel, galvanized (unpainted)	Zinc	Zinc-aluminium-magneisum (combinations), coated (1)	Zinc-aluminium-magnesium (combinations), (unpainted)
Aluminium, anodised or mill-finish	✓	✓	✓	✘	✓	✘	✘	✘	✓	✘	✘	✓	✓	✘	✓	B	✓	✓	✓	✓	✓
Aluminium, coated (1)	✓	✓	✓	B	✓	✘	✘	✘	✓	✘	✘	✓	✓	B	✓	B	✓	✓	✓	✓	✓
Butyl rubber & EDPM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CCA-treated timber (2)	✘	B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	B	✘	✘	B	✘
Cedar	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✘	✓	✘
Cement plaster (uncoated)	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✓	✓	✓	✓	✓	✓	✘
Ceramic tiles (cement grout)	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘
Clay bricks (cement mortar)	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘
Concrete old (unpainted)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Concrete green (unpainted)	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✘	✓	✓	✘	✘	✘	✘	✘
Copper/brass	✘	✘	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	B	✓	B	✘	✘	✘	✘	✘
Glass	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Glazed roof tiles	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lead (including lead-edged) unpainted	✘	B	✓	✓	✓	✘	✓	✓	✓	✘	B	✓	✓	✓	✓	B	B	B	B	B	✘
Plastics	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stainless steel	B	B	✓	✓	✓	✓	✓	✓	✓	✓	B	✓	✓	B	✓	✓	B	✘	✘	B	B
Steel, galvanised coil-coated	✓	✓	✓	B	✓	✓	✓	✓	✓	✘	✘	✓	✓	B	✓	B	✓	✓	✓	✓	✓
Steel, galvanized (unpainted)	✓	✓	✓	✘	✘	✓	✓	✓	✓	✘	✘	✓	✓	B	✓	✘	✓	✓	✓	✓	✓
Zinc	✓	✓	✓	✘	✘	✓	✓	✓	✓	✘	✘	✓	✓	B	✓	✘	✓	✓	✓	✓	✓
Zinc-aluminium-magenesium (combinations), coated (1)	✓	✓	✓	B	✓	✓	✓	✓	✓	✘	✘	✓	✓	B	✓	B	✓	✓	✓	✓	✓
Zinc-aluminium-magnesium (combinations) (unpainted)	✓	✓	✓	✘	✘	✘	✘	✘	✓	✘	✘	✓	✓	✘	✓	B	✓	✓	✓	✓	✓

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LEGEND:
✓ Materials satisfactory in contact.
✘ Contact between materials is not permitted. Minimum gap of 5 mm is required to prevent moisture bridging.
B Avoid contact in sea-spray zone or corrosion zone D.

NOTES:

(1) Coated – includes factory-painted, coil-coated and powder-coated.

(2) Includes copper azole and copper quaternary salts.

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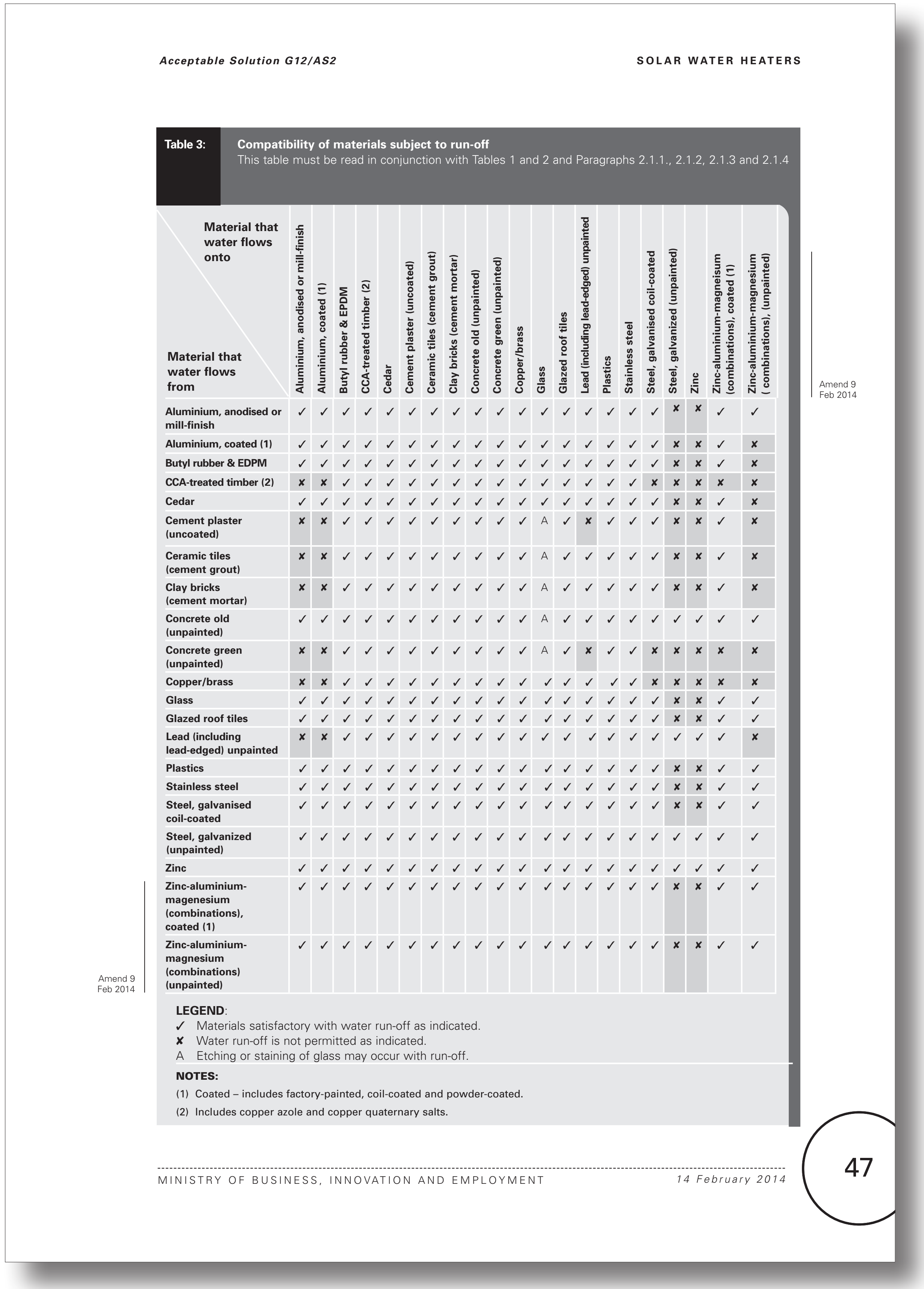

Table 3: **Compatibility of materials subject to run-off**
This table must be read in conjunction with Tables 1 and 2 and Paragraphs 2.1.1., 2.1.2, 2.1.3 and 2.1.4

Material that water flows onto / Material that water flows from	Aluminium, anodised or mill-finish	Aluminium, coated (1)	Butyl rubber & EPDM	CCA-treated timber (2)	Cedar	Cement plaster (uncoated)	Ceramic tiles (cement grout)	Clay bricks (cement mortar)	Concrete old (unpainted)	Concrete green (unpainted)	Copper/brass	Glass	Glazed roof tiles	Lead (including lead-edged) unpainted	Plastics	Stainless steel	Steel, galvanised coil-coated	Steel, galvanized (unpainted)	Zinc	Zinc-aluminium-magneisum (combinations), coated (1)	Zinc-aluminium-magnesium (combinations), (unpainted)
Aluminium, anodised or mill-finish	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓
Aluminium, coated (1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗
Butyl rubber & EDPM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗
CCA-treated timber (2)	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗
Cedar	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗
Cement plaster (uncoated)	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✗	✓	✓	✓	✗	✗	✓	✗
Ceramic tiles (cement grout)	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✗	✗	✓	✗
Clay bricks (cement mortar)	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✗	✗	✓	✗
Concrete old (unpainted)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓
Concrete green (unpainted)	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✗	✓	✓	✗	✗	✗	✗	✗
Copper/brass	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗
Glass	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓
Glazed roof tiles	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓
Lead (including lead-edged) unpainted	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
Plastics	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓
Stainless steel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓
Steel, galvanised coil-coated	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓
Steel, galvanized (unpainted)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Zinc	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Zinc-aluminium-magenesium (combinations), coated (1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓
Zinc-aluminium-magnesium (combinations) (unpainted)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓

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LEGEND:
✓ Materials satisfactory with water run-off as indicated.
✗ Water run-off is not permitted as indicated.
A Etching or staining of glass may occur with run-off.

NOTES:

(1) Coated – includes factory-painted, coil-coated and powder-coated.

(2) Includes copper azole and copper quaternary salts.

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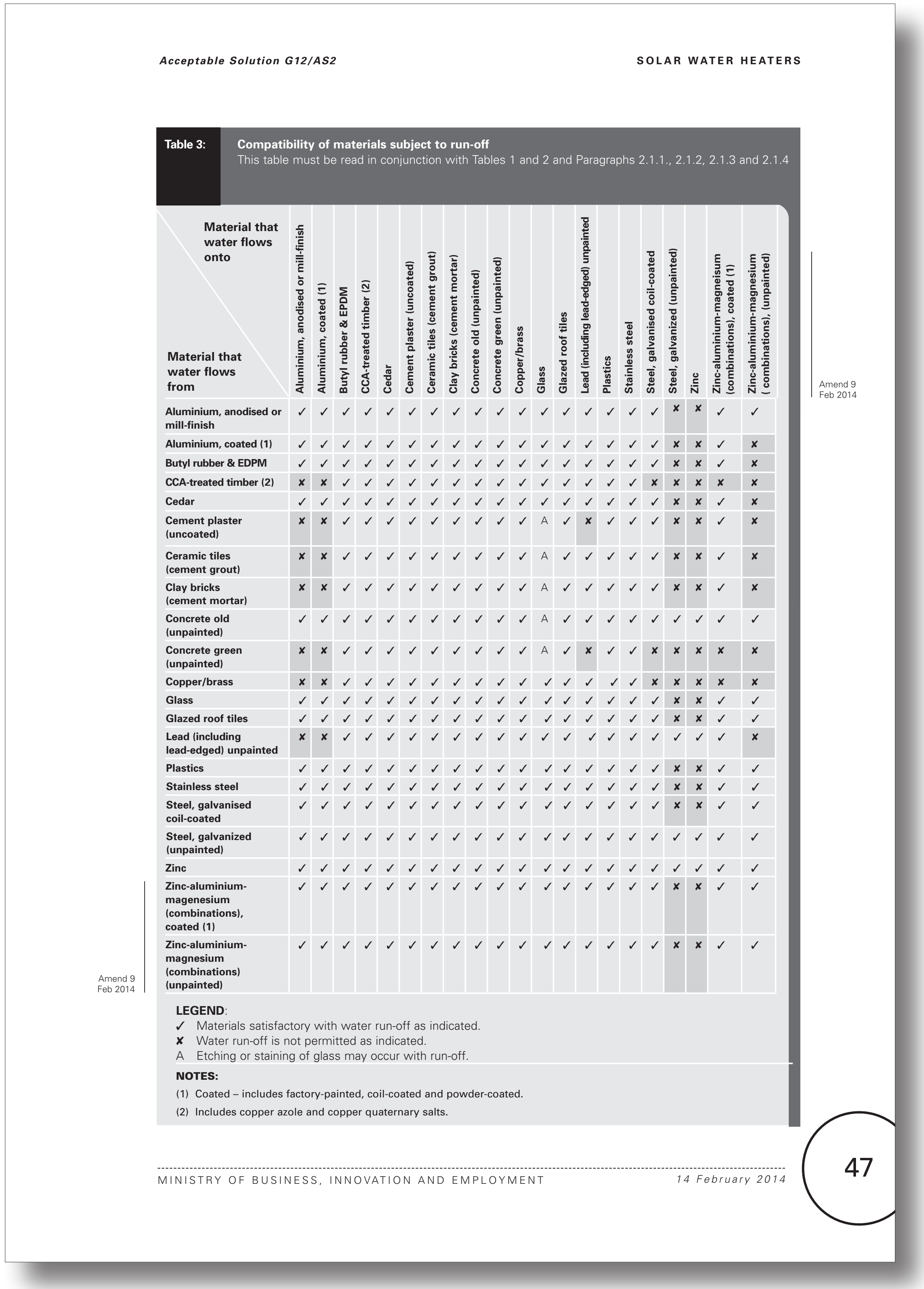

Acceptable Solution G12/AS2 SOLAR WATER HEATERS

Table 3: **Compatibility of materials subject to run-off**
This table must be read in conjunction with Tables 1 and 2 and Paragraphs 2.1.1., 2.1.2, 2.1.3 and 2.1.4

Material that water flows onto / Material that water flows from	Aluminium, anodised or mill-finish	Aluminium, coated (1)	Butyl rubber & EPDM	CCA-treated timber (2)	Cedar	Cement plaster (uncoated)	Ceramic tiles (cement grout)	Clay bricks (cement mortar)	Concrete old (unpainted)	Concrete green (unpainted)	Copper/brass	Glass	Glazed roof tiles	Lead (including lead-edged) unpainted	Plastics	Stainless steel	Steel, galvanised coil-coated	Steel, galvanized (unpainted)	Zinc	Zinc-aluminium-magneisum (combinations), coated (1)	Zinc-aluminium-magnesium (combinations), (unpainted)
Aluminium, anodised or mill-finish	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓
Aluminium, coated (1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗
Butyl rubber & EDPM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗
CCA-treated timber (2)	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗
Cedar	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗
Cement plaster (uncoated)	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✗	✓	✓	✓	✗	✗	✓	✗
Ceramic tiles (cement grout)	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✗	✗	✓	✗
Clay bricks (cement mortar)	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✗	✗	✓	✗
Concrete old (unpainted)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓
Concrete green (unpainted)	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✗	✓	✓	✗	✗	✗	✗	✗
Copper/brass	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗
Glass	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓
Glazed roof tiles	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓
Lead (including lead-edged) unpainted	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
Plastics	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓
Stainless steel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓
Steel, galvanised coil-coated	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓
Steel, galvanized (unpainted)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Zinc	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Zinc-aluminium-magenesium (combinations), coated (1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓
Zinc-aluminium-magnesium (combinations) (unpainted)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓

Amend 9
Feb 2014

Amend 9
Feb 2014

LEGEND:
✓ Materials satisfactory with water run-off as indicated.
✗ Water run-off is not permitted as indicated.
A Etching or staining of glass may occur with run-off.

NOTES:

(1) Coated – includes factory-painted, coil-coated and powder-coated.

(2) Includes copper azole and copper quaternary salts.

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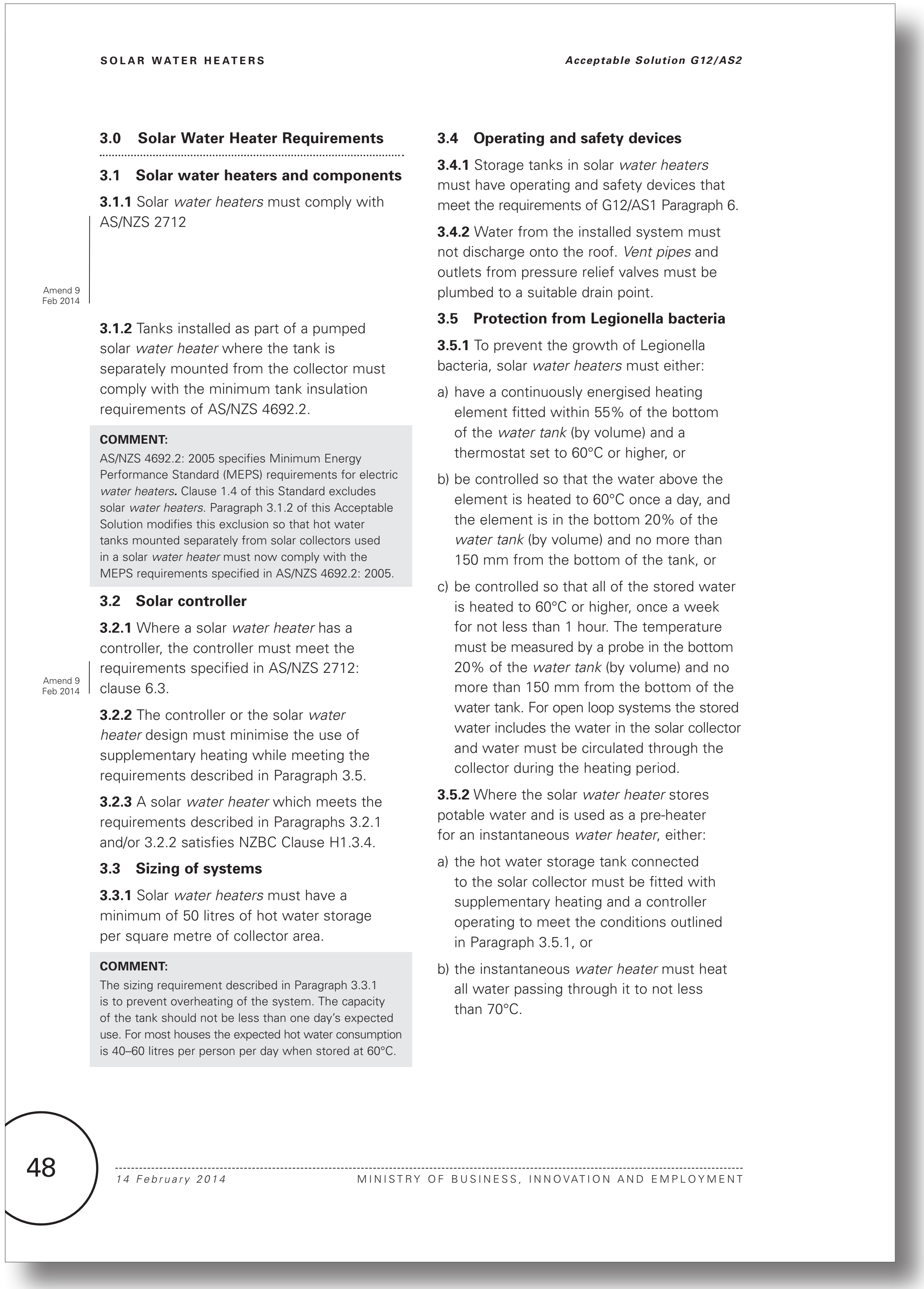
Current G12 Water Supplies - No changes proposed to this page



3.0 Solar Water Heater Requirements

3.1 Solar water heaters and components

3.1.1 Solar *water heaters* must comply with AS/NZS 2712

Amend 9 Feb 2014

3.1.2 Tanks installed as part of a pumped solar *water heater* where the tank is separately mounted from the collector must comply with the minimum tank insulation requirements of AS/NZS 4692.2.

COMMENT:
AS/NZS 4692.2: 2005 specifies Minimum Energy Performance Standard (MEPS) requirements for electric *water heaters.* Clause 1.4 of this Standard excludes solar *water heaters.* Paragraph 3.1.2 of this Acceptable Solution modifies this exclusion so that hot water tanks mounted separately from solar collectors used in a solar *water heater* must now comply with the MEPS requirements specified in AS/NZS 4692.2: 2005.

3.2 Solar controller

3.2.1 Where a solar *water heater* has a controller, the controller must meet the requirements specified in AS/NZS 2712: clause 6.3.

Amend 9 Feb 2014

3.2.2 The controller or the solar *water heater* design must minimise the use of supplementary heating while meeting the requirements described in Paragraph 3.5.

3.2.3 A solar *water heater* which meets the requirements described in Paragraphs 3.2.1 and/or 3.2.2 satisfies NZBC Clause H1.3.4.

3.3 Sizing of systems

3.3.1 Solar *water heaters* must have a minimum of 50 litres of hot water storage per square metre of collector area.

COMMENT:
The sizing requirement described in Paragraph 3.3.1 is to prevent overheating of the system. The capacity of the tank should not be less than one day's expected use. For most houses the expected hot water consumption is 40–60 litres per person per day when stored at 60°C.

3.4 Operating and safety devices

3.4.1 Storage tanks in solar *water heaters* must have operating and safety devices that meet the requirements of G12/AS1 Paragraph 6.

3.4.2 Water from the installed system must not discharge onto the roof. *Vent pipes* and outlets from pressure relief valves must be plumbed to a suitable drain point.

3.5 Protection from Legionella bacteria

3.5.1 To prevent the growth of Legionella bacteria, solar *water heaters* must either:

a) have a continuously energised heating element fitted within 55% of the bottom of the *water tank* (by volume) and a thermostat set to 60°C or higher, or

b) be controlled so that the water above the element is heated to 60°C once a day, and the element is in the bottom 20% of the *water tank* (by volume) and no more than 150 mm from the bottom of the tank, or

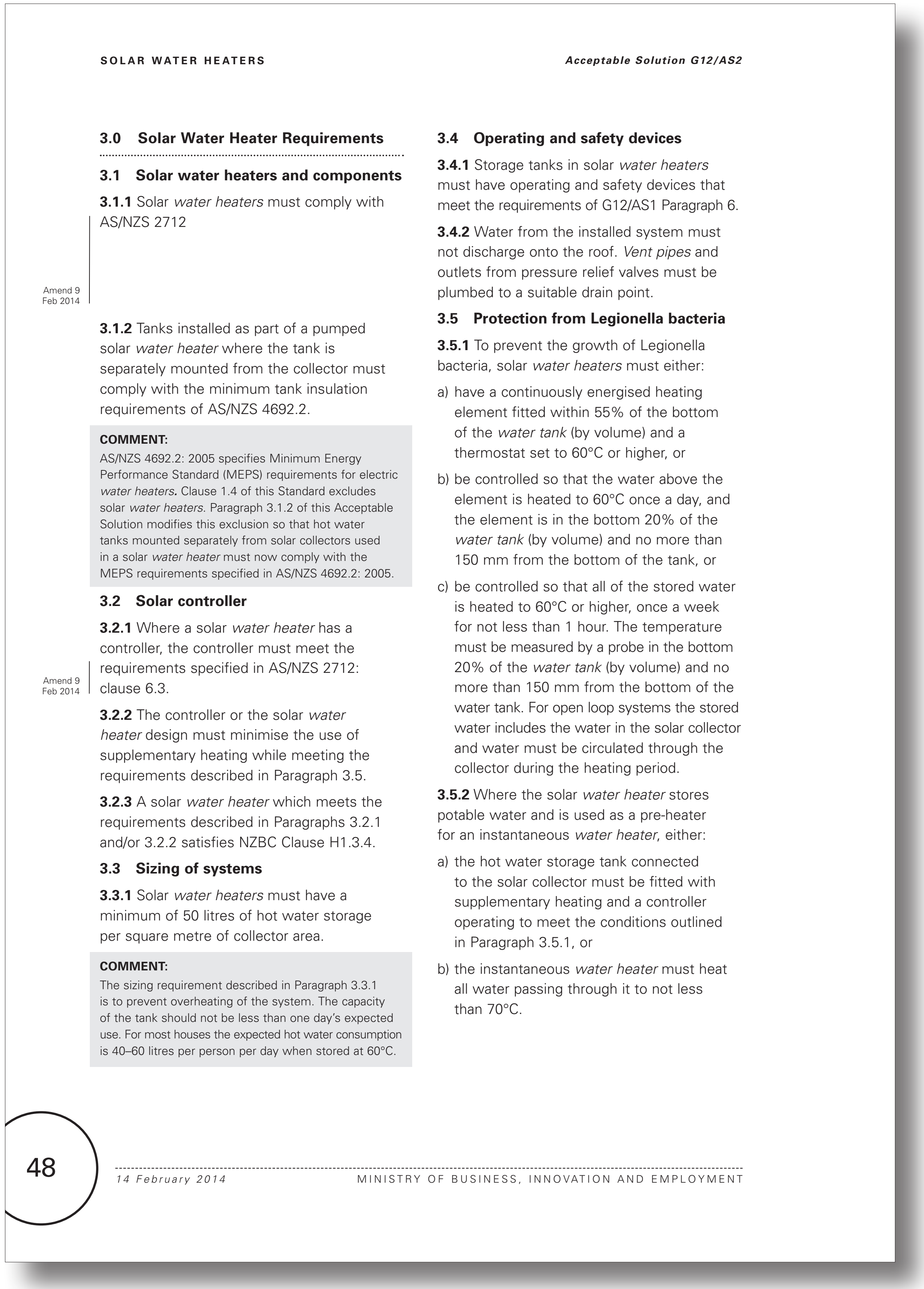
c) be controlled so that all of the stored water is heated to 60°C or higher, once a week for not less than 1 hour. The temperature must be measured by a probe in the bottom 20% of the *water tank* (by volume) and no more than 150 mm from the bottom of the water tank. For open loop systems the stored water includes the water in the solar collector and water must be circulated through the collector during the heating period.

3.5.2 Where the solar *water heater* stores potable water and is used as a pre-heater for an instantaneous *water heater*, either:

a) the hot water storage tank connected to the solar collector must be fitted with supplementary heating and a controller operating to meet the conditions outlined in Paragraph 3.5.1, or

b) the instantaneous *water heater* must heat all water passing through it to not less than 70°C.

Proposed G12 Water Supplies - No changes proposed to this page



SOLAR WATER HEATERS Acceptable Solution G12/AS2

3.0 Solar Water Heater Requirements

3.1 Solar water heaters and components

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Amend 9 Feb 2014

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COMMENT:
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Amend 9 Feb 2014

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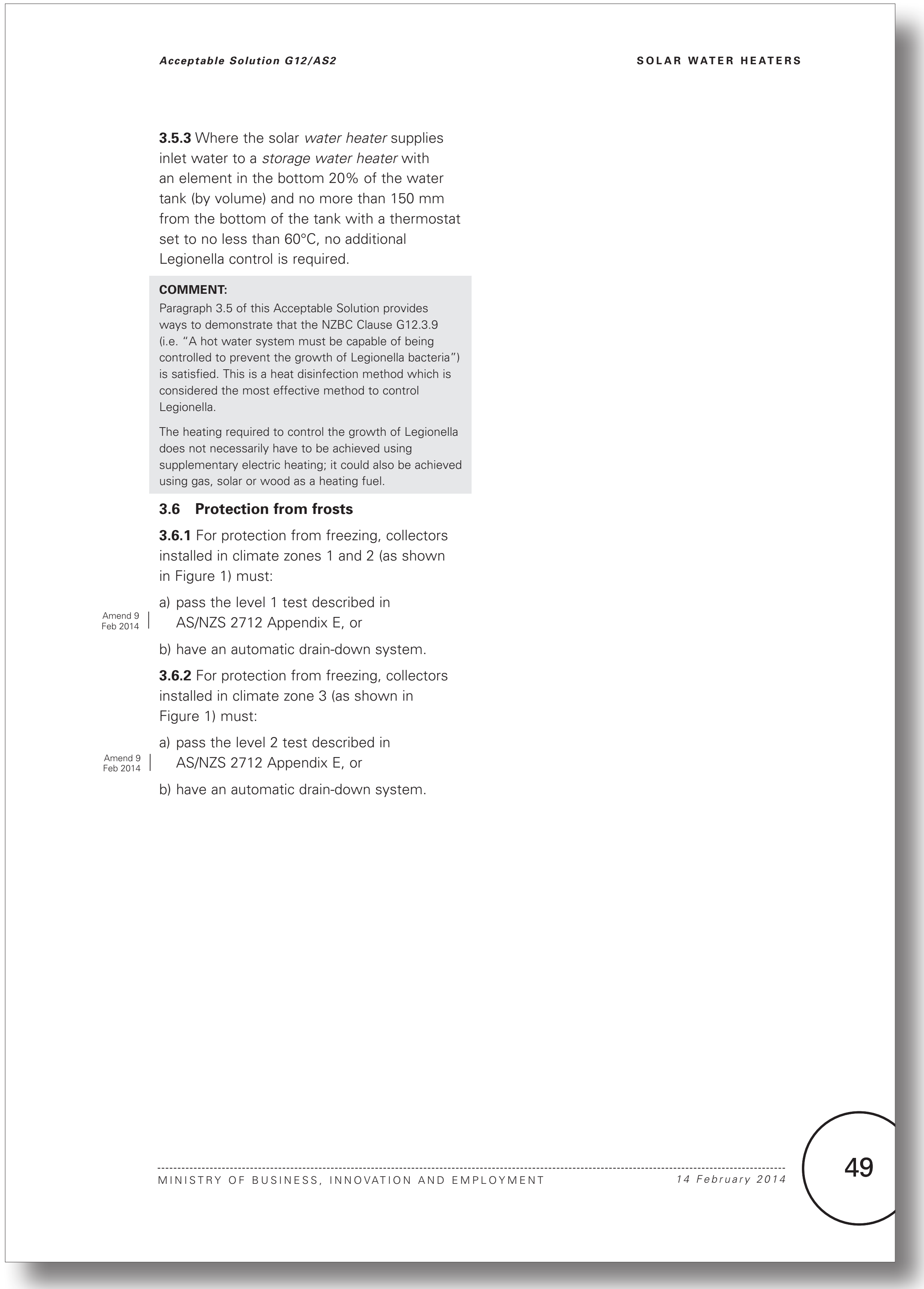

3.5.3 Where the solar *water heater* supplies inlet water to a *storage water heater* with an element in the bottom 20% of the water tank (by volume) and no more than 150 mm from the bottom of the tank with a thermostat set to no less than 60°C, no additional Legionella control is required.

COMMENT:
Paragraph 3.5 of this Acceptable Solution provides ways to demonstrate that the NZBC Clause G12.3.9 (i.e. "A hot water system must be capable of being controlled to prevent the growth of Legionella bacteria") is satisfied. This is a heat disinfection method which is considered the most effective method to control Legionella.

The heating required to control the growth of Legionella does not necessarily have to be achieved using supplementary electric heating; it could also be achieved using gas, solar or wood as a heating fuel.

3.6 Protection from frosts

3.6.1 For protection from freezing, collectors installed in climate zones 1 and 2 (as shown in Figure 1) must:

a) pass the level 1 test described in AS/NZS 2712 Appendix E, or Amend 9 Feb 2014

b) have an automatic drain-down system.

3.6.2 For protection from freezing, collectors installed in climate zone 3 (as shown in Figure 1) must:

a) pass the level 2 test described in AS/NZS 2712 Appendix E, or Amend 9 Feb 2014

b) have an automatic drain-down system.

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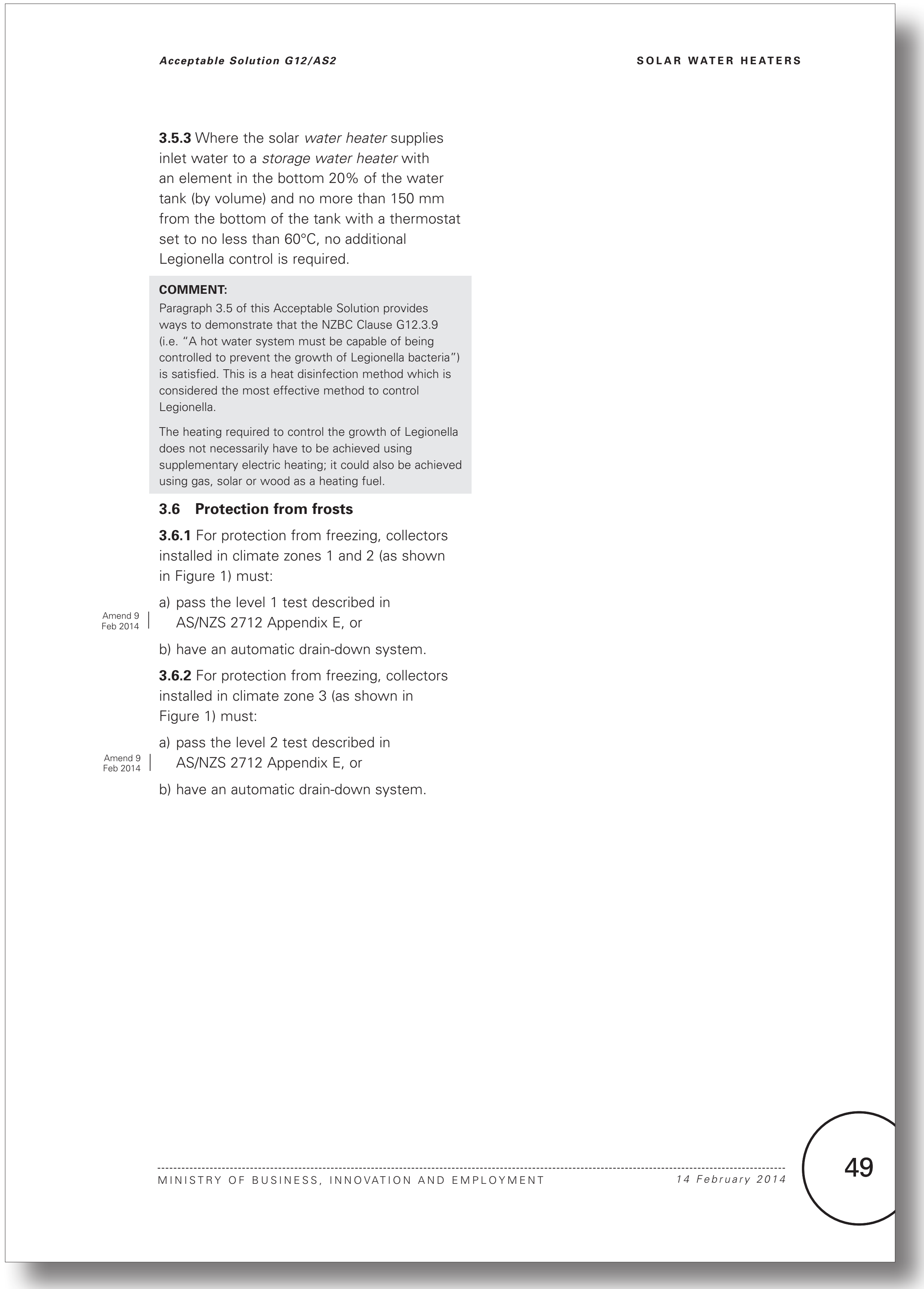

Acceptable Solution G12/AS2 SOLAR WATER HEATERS

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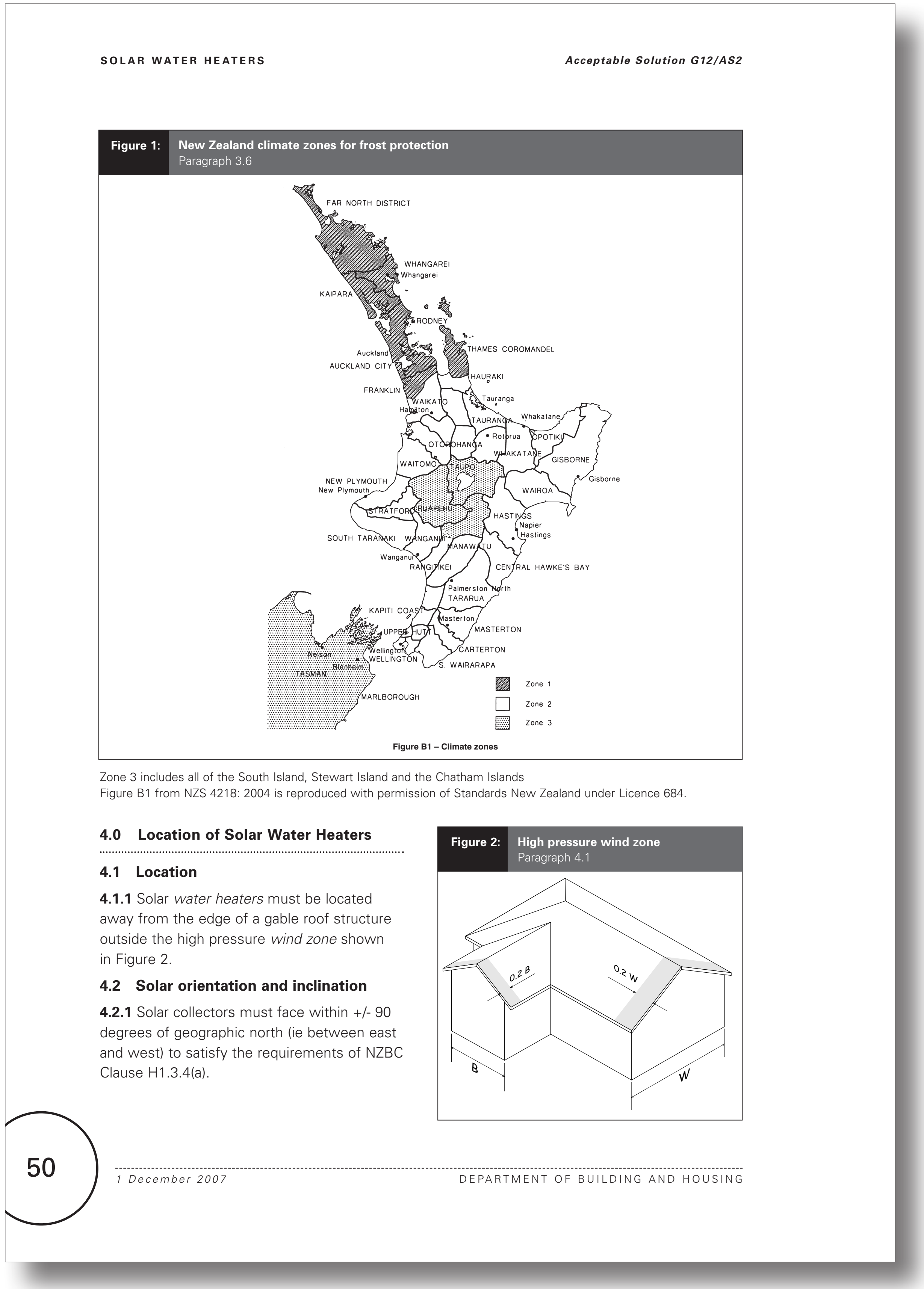

Figure 1: **New Zealand climate zones for frost protection**
Paragraph 3.6

Figure B1 – Climate zones

Zone 3 includes all of the South Island, Stewart Island and the Chatham Islands
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4.0 Location of Solar Water Heaters

4.1 Location

4.1.1 Solar *water heaters* must be located away from the edge of a gable roof structure outside the high pressure *wind zone* shown in Figure 2.

4.2 Solar orientation and inclination

4.2.1 Solar collectors must face within +/- 90 degrees of geographic north (ie between east and west) to satisfy the requirements of NZBC Clause H1.3.4(a).

Figure 2: **High pressure wind zone**
Paragraph 4.1

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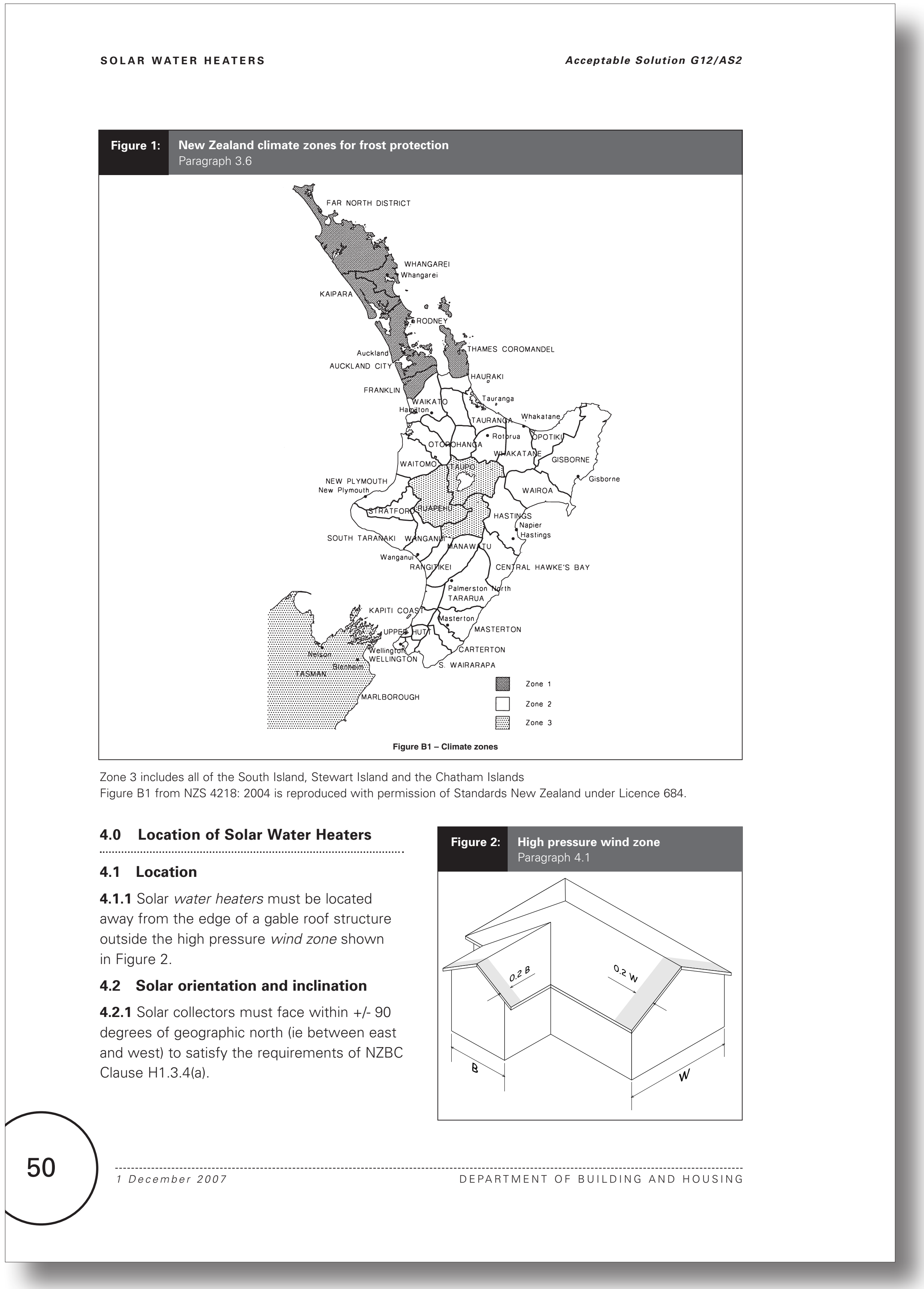

SOLAR WATER HEATERS Acceptable Solution G12/AS2

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Figure 2: High pressure wind zone
Paragraph 4.1

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1 December 2007 DEPARTMENT OF BUILDING AND HOUSING

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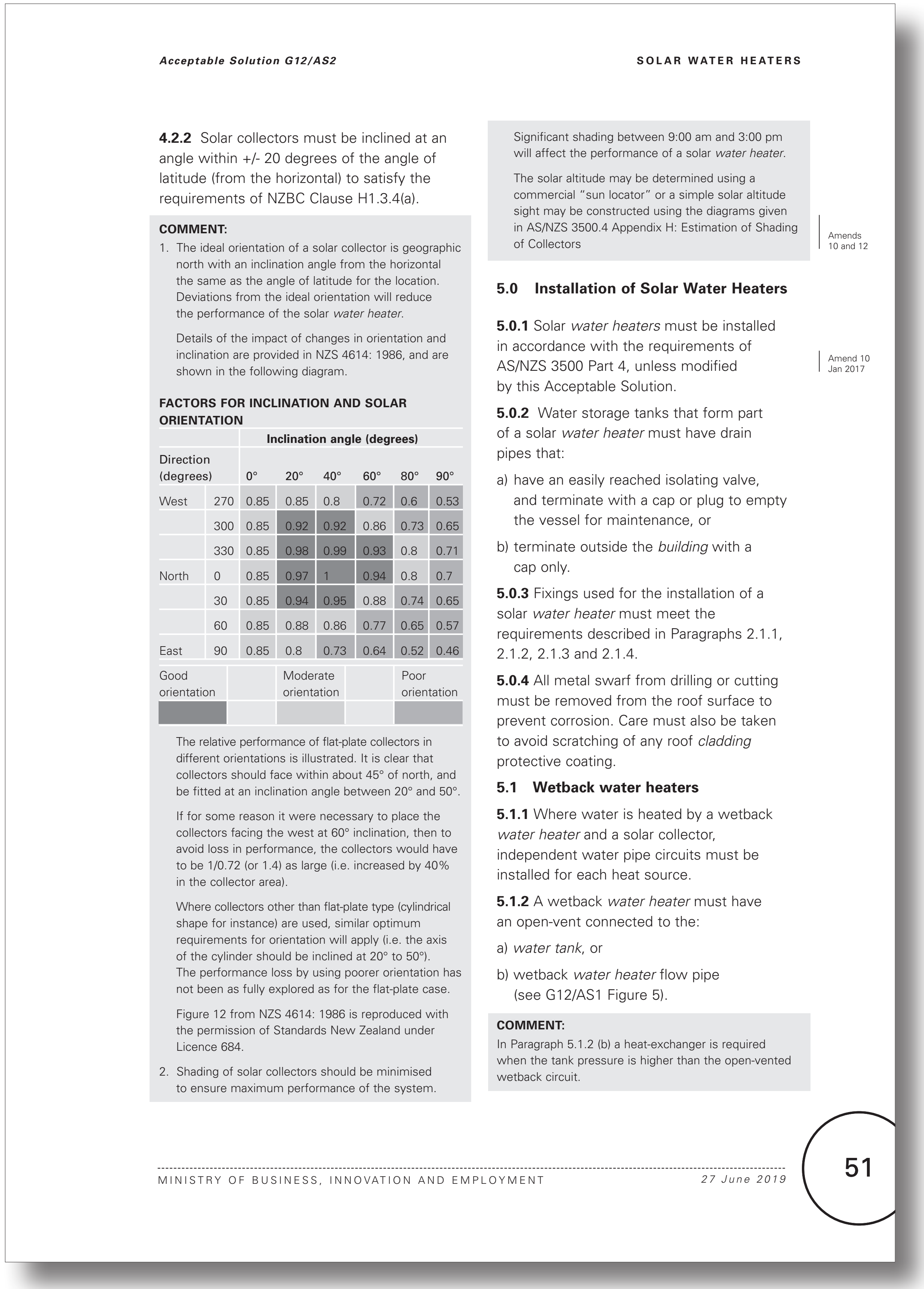

4.2.2 Solar collectors must be inclined at an angle within +/- 20 degrees of the angle of latitude (from the horizontal) to satisfy the requirements of NZBC Clause H1.3.4(a).

COMMENT:

1. The ideal orientation of a solar collector is geographic north with an inclination angle from the horizontal the same as the angle of latitude for the location. Deviations from the ideal orientation will reduce the performance of the solar *water heater.*

   Details of the impact of changes in orientation and inclination are provided in NZS 4614: 1986, and are shown in the following diagram.

FACTORS FOR INCLINATION AND SOLAR ORIENTATION

		Inclination angle (degrees)					
Direction (degrees)		0°	20°	40°	60°	80°	90°
West	270	0.85	0.85	0.8	0.72	0.6	0.53
	300	0.85	0.92	0.92	0.86	0.73	0.65
	330	0.85	0.98	0.99	0.93	0.8	0.71
North	0	0.85	0.97	1	0.94	0.8	0.7
	30	0.85	0.94	0.95	0.88	0.74	0.65
	60	0.85	0.88	0.86	0.77	0.65	0.57
East	90	0.85	0.8	0.73	0.64	0.52	0.46

Good orientation	Moderate orientation	Poor orientation
▨	░	▒

   The relative performance of flat-plate collectors in different orientations is illustrated. It is clear that collectors should face within about 45° of north, and be fitted at an inclination angle between 20° and 50°.

   If for some reason it were necessary to place the collectors facing the west at 60° inclination, then to avoid loss in performance, the collectors would have to be 1/0.72 (or 1.4) as large (i.e. increased by 40% in the collector area).

   Where collectors other than flat-plate type (cylindrical shape for instance) are used, similar optimum requirements for orientation will apply (i.e. the axis of the cylinder should be inclined at 20° to 50°). The performance loss by using poorer orientation has not been as fully explored as for the flat-plate case.

   Figure 12 from NZS 4614: 1986 is reproduced with the permission of Standards New Zealand under Licence 684.

2. Shading of solar collectors should be minimised to ensure maximum performance of the system.

   Significant shading between 9:00 am and 3:00 pm will affect the performance of a solar *water heater.*

   The solar altitude may be determined using a commercial "sun locator" or a simple solar altitude sight may be constructed using the diagrams given in AS/NZS 3500.4 Appendix H: Estimation of Shading of Collectors

Amends 10 and 12

5.0 Installation of Solar Water Heaters

5.0.1 Solar *water heaters* must be installed in accordance with the requirements of AS/NZS 3500 Part 4, unless modified by this Acceptable Solution.

Amend 10 Jan 2017

5.0.2 Water storage tanks that form part of a solar *water heater* must have drain pipes that:

a) have an easily reached isolating valve, and terminate with a cap or plug to empty the vessel for maintenance, or

b) terminate outside the *building* with a cap only.

5.0.3 Fixings used for the installation of a solar *water heater* must meet the requirements described in Paragraphs 2.1.1, 2.1.2, 2.1.3 and 2.1.4.

5.0.4 All metal swarf from drilling or cutting must be removed from the roof surface to prevent corrosion. Care must also be taken to avoid scratching of any roof *cladding* protective coating.

5.1 Wetback water heaters

5.1.1 Where water is heated by a wetback *water heater* and a solar collector, independent water pipe circuits must be installed for each heat source.

5.1.2 A wetback *water heater* must have an open-vent connected to the:

a) *water tank,* or

b) wetback *water heater* flow pipe (see G12/AS1 Figure 5).

COMMENT:

In Paragraph 5.1.2 (b) a heat-exchanger is required when the tank pressure is higher than the open-vented wetback circuit.

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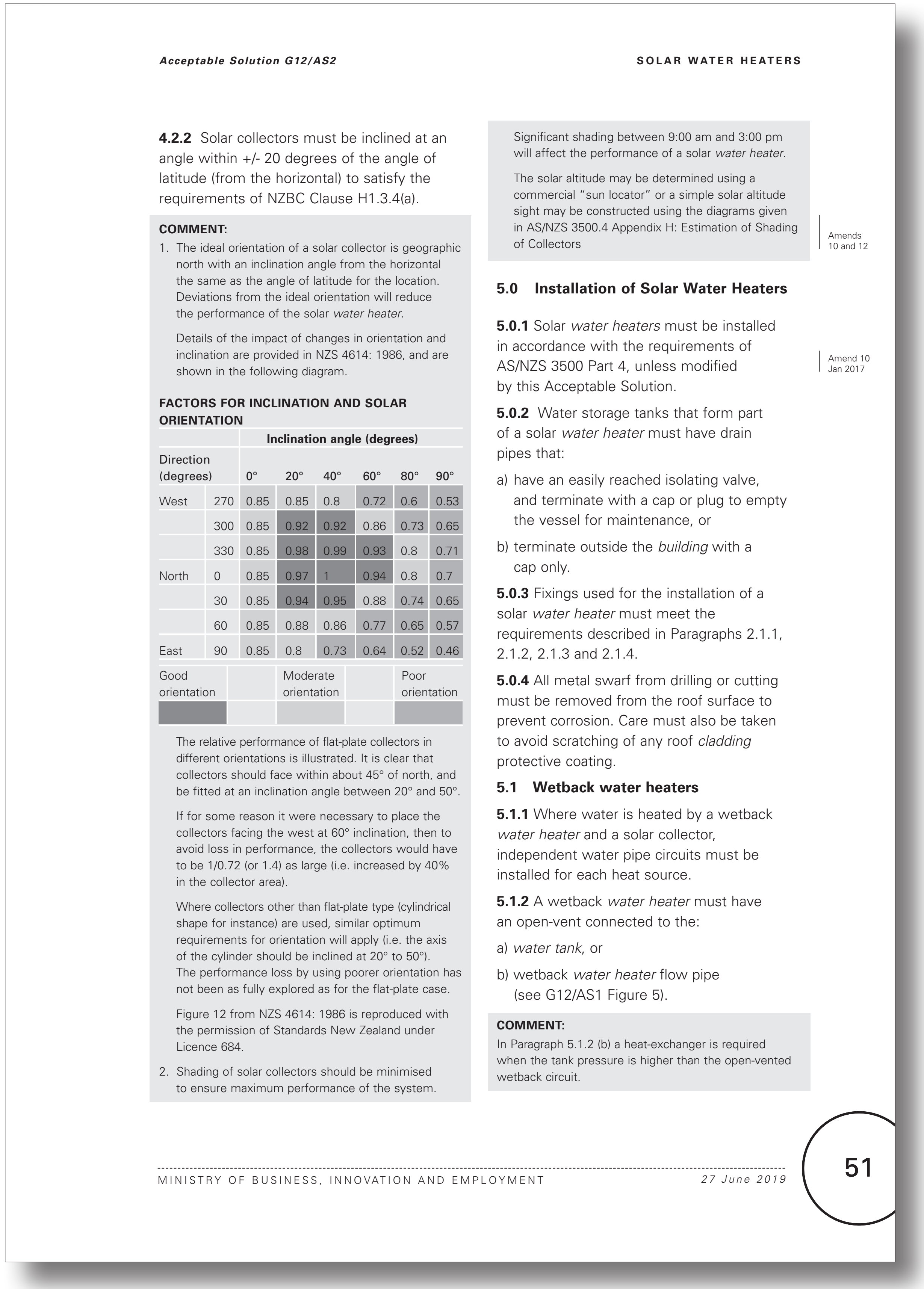

Acceptable Solution G12/AS2 SOLAR WATER HEATERS

4.2.2 Solar collectors must be inclined at an angle within +/- 20 degrees of the angle of latitude (from the horizontal) to satisfy the requirements of NZBC Clause H1.3.4(a).

COMMENT:

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	30	0.85	0.94	0.95	0.88	0.74	0.65
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East	90	0.85	0.8	0.73	0.64	0.52	0.46

Good orientation	Moderate orientation	Poor orientation
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Amend 10 Jan 2017

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COMMENT:

In Paragraph 5.1.2 (b) a heat-exchanger is required when the tank pressure is higher than the open-vented wetback circuit.

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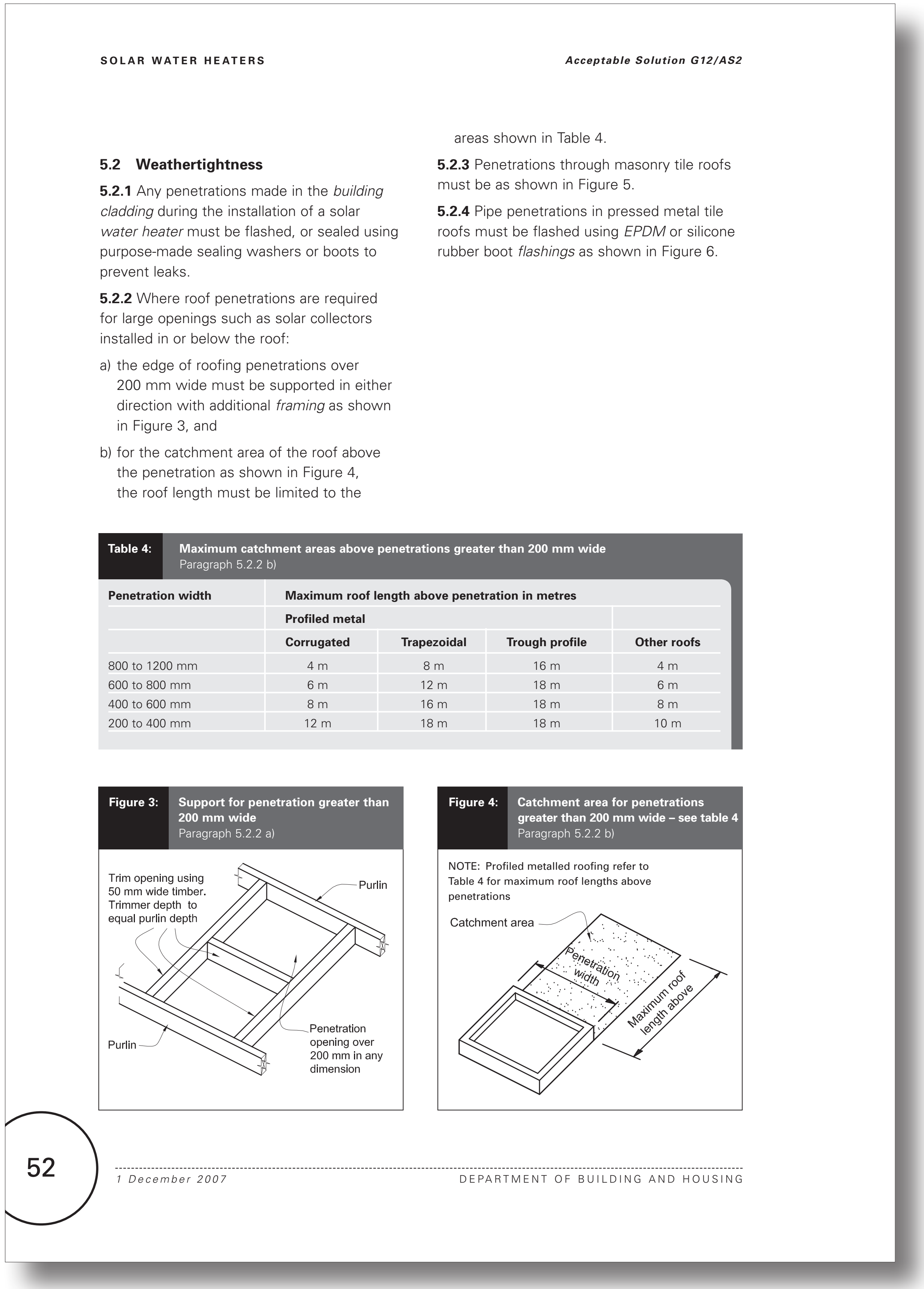


5.2 Weathertightness

5.2.1 Any penetrations made in the *building cladding* during the installation of a solar *water heater* must be flashed, or sealed using purpose-made sealing washers or boots to prevent leaks.

5.2.2 Where roof penetrations are required for large openings such as solar collectors installed in or below the roof:

a) the edge of roofing penetrations over 200 mm wide must be supported in either direction with additional *framing* as shown in Figure 3, and

b) for the catchment area of the roof above the penetration as shown in Figure 4, the roof length must be limited to the areas shown in Table 4.

5.2.3 Penetrations through masonry tile roofs must be as shown in Figure 5.

5.2.4 Pipe penetrations in pressed metal tile roofs must be flashed using *EPDM* or silicone rubber boot *flashings* as shown in Figure 6.

Table 4: Maximum catchment areas above penetrations greater than 200 mm wide
Paragraph 5.2.2 b)

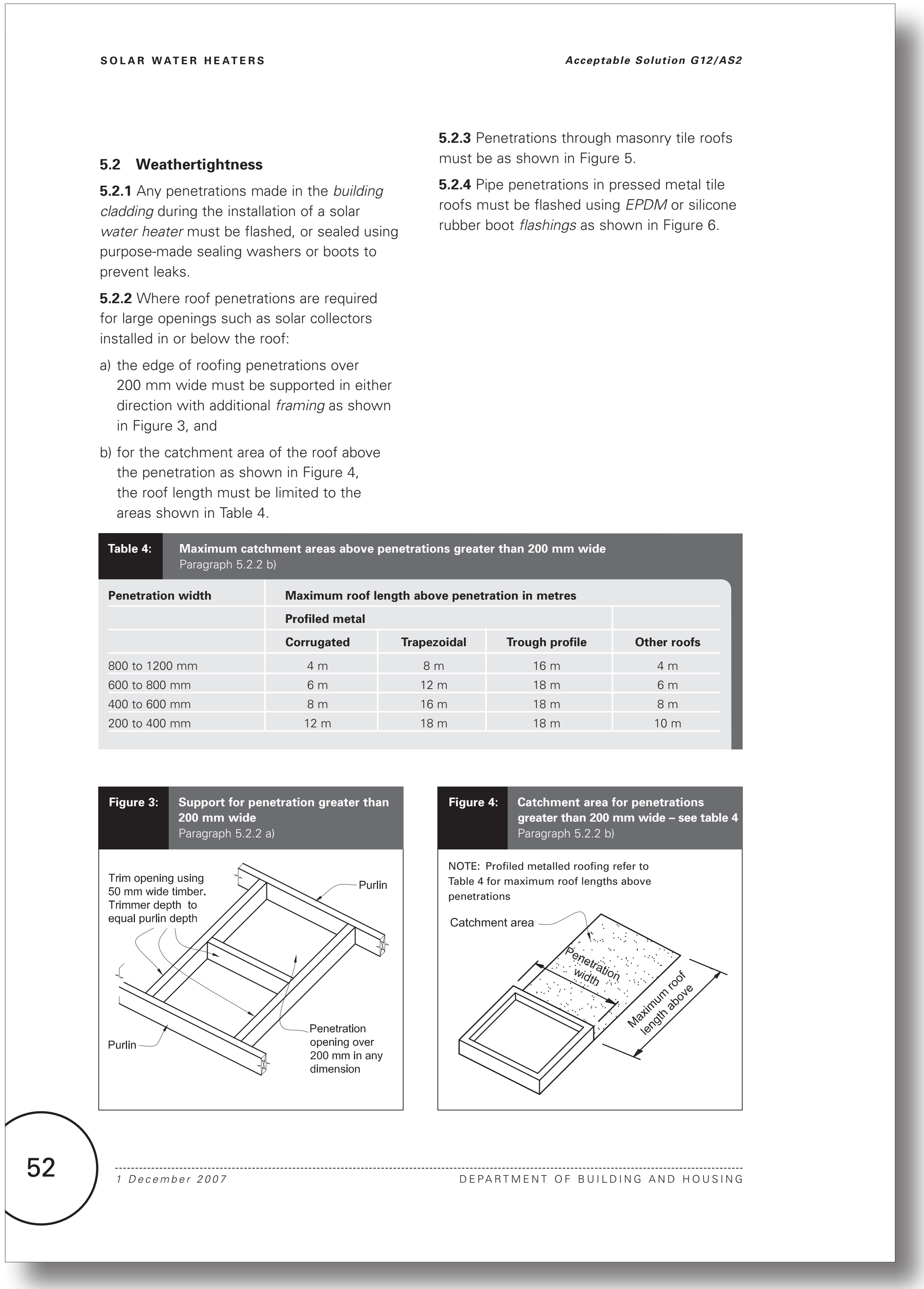
Penetration width	Maximum roof length above penetration in metres			
	Profiled metal			
	Corrugated	Trapezoidal	Trough profile	Other roofs
800 to 1200 mm	4 m	8 m	16 m	4 m
600 to 800 mm	6 m	12 m	18 m	6 m
400 to 600 mm	8 m	16 m	18 m	8 m
200 to 400 mm	12 m	18 m	18 m	10 m

Figure 3: Support for penetration greater than 200 mm wide
Paragraph 5.2.2 a)

Figure 4: Catchment area for penetrations greater than 200 mm wide – see table 4
Paragraph 5.2.2 b)

NOTE: Profiled metalled roofing refer to Table 4 for maximum roof lengths above penetrations

Proposed G12 Water Supplies - No changes proposed to this page



SOLAR WATER HEATERS Acceptable Solution G12/AS2

5.2 Weathertightness

5.2.1 Any penetrations made in the building cladding during the installation of a solar water heater must be flashed, or sealed using purpose-made sealing washers or boots to prevent leaks.

5.2.2 Where roof penetrations are required for large openings such as solar collectors installed in or below the roof:

a) the edge of roofing penetrations over 200 mm wide must be supported in either direction with additional framing as shown in Figure 3, and

b) for the catchment area of the roof above the penetration as shown in Figure 4, the roof length must be limited to the areas shown in Table 4.

5.2.3 Penetrations through masonry tile roofs must be as shown in Figure 5.

5.2.4 Pipe penetrations in pressed metal tile roofs must be flashed using EPDM or silicone rubber boot flashings as shown in Figure 6.

Table 4: Maximum catchment areas above penetrations greater than 200 mm wide
Paragraph 5.2.2 b)

Penetration width	Maximum roof length above penetration in metres			
	Profiled metal			
	Corrugated	Trapezoidal	Trough profile	Other roofs
800 to 1200 mm	4 m	8 m	16 m	4 m
600 to 800 mm	6 m	12 m	18 m	6 m
400 to 600 mm	8 m	16 m	18 m	8 m
200 to 400 mm	12 m	18 m	18 m	10 m

Figure 3: Support for penetration greater than 200 mm wide
Paragraph 5.2.2 a)

Figure 4: Catchment area for penetrations greater than 200 mm wide – see table 4
Paragraph 5.2.2 b)

NOTE: Profiled metalled roofing refer to Table 4 for maximum roof lengths above penetrations

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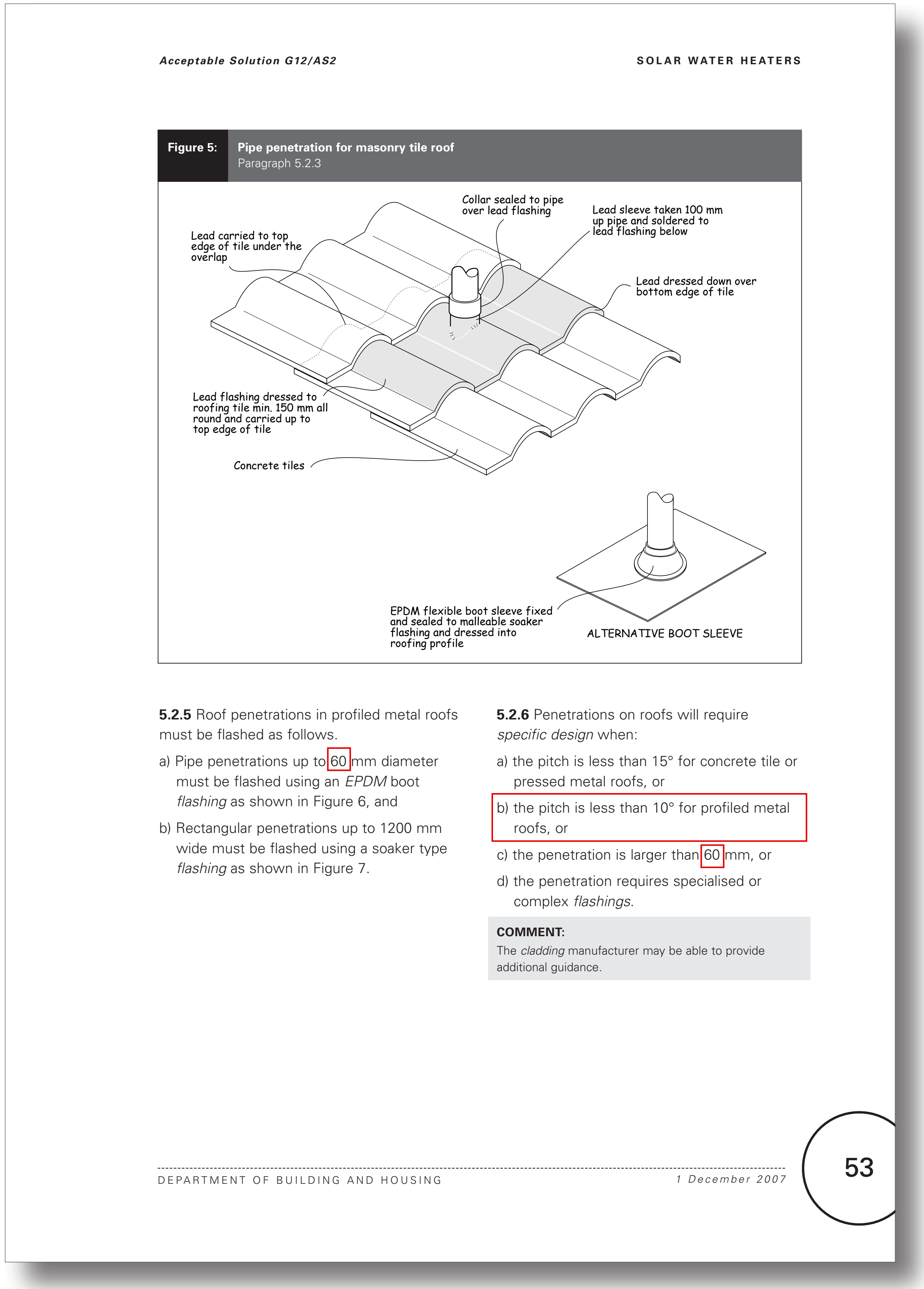
Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



Acceptable Solution G12/AS2 SOLAR WATER HEATERS

Figure 5: **Pipe penetration for masonry tile roof**
Paragraph 5.2.3

5.2.5 Roof penetrations in profiled metal roofs must be flashed as follows.

a) Pipe penetrations up to 60 mm diameter must be flashed using an *EPDM* boot *flashing* as shown in Figure 6, and

b) Rectangular penetrations up to 1200 mm wide must be flashed using a soaker type *flashing* as shown in Figure 7.

5.2.6 Penetrations on roofs will require *specific design* when:

a) the pitch is less than 15° for concrete tile or pressed metal roofs, or

b) the pitch is less than 10° for profiled metal roofs, or

c) the penetration is larger than 60 mm, or

d) the penetration requires specialised or complex *flashings*.

COMMENT:
The *cladding* manufacturer may be able to provide additional guidance.

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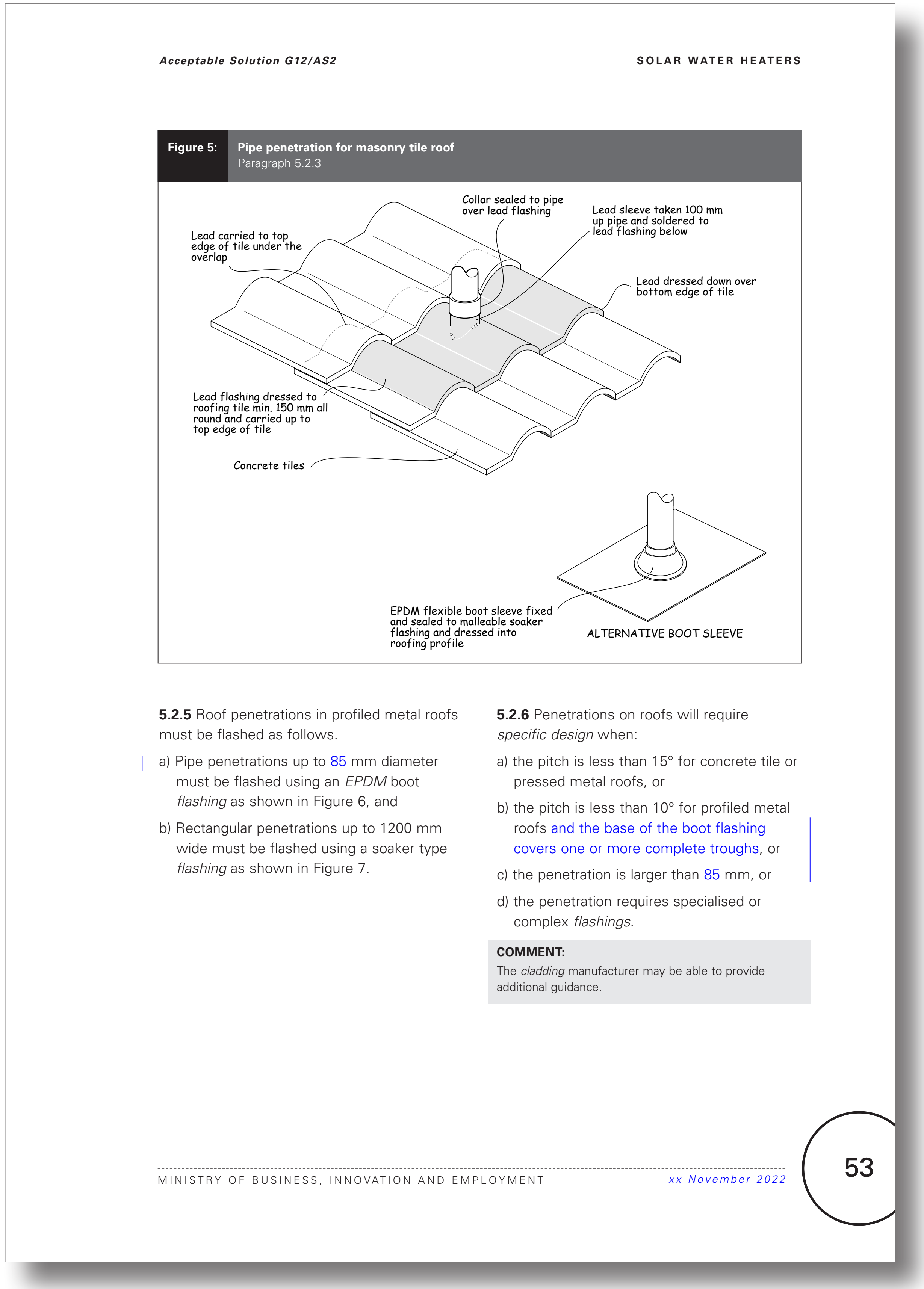
Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



Acceptable Solution G12/AS2 SOLAR WATER HEATERS

Figure 5: **Pipe penetration for masonry tile roof**
Paragraph 5.2.3

5.2.5 Roof penetrations in profiled metal roofs must be flashed as follows.

a) Pipe penetrations up to 85 mm diameter must be flashed using an *EPDM* boot *flashing* as shown in Figure 6, and

b) Rectangular penetrations up to 1200 mm wide must be flashed using a soaker type *flashing* as shown in Figure 7.

5.2.6 Penetrations on roofs will require *specific design* when:

a) the pitch is less than 15° for concrete tile or pressed metal roofs, or

b) the pitch is less than 10° for profiled metal roofs and the base of the boot flashing covers one or more complete troughs, or

c) the penetration is larger than 85 mm, or

d) the penetration requires specialised or complex *flashings*.

COMMENT:
The *cladding* manufacturer may be able to provide additional guidance.

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Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)

SOLAR WATER HEATERS

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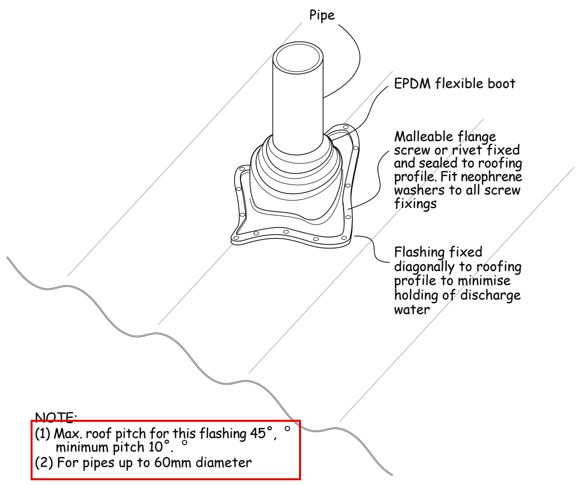
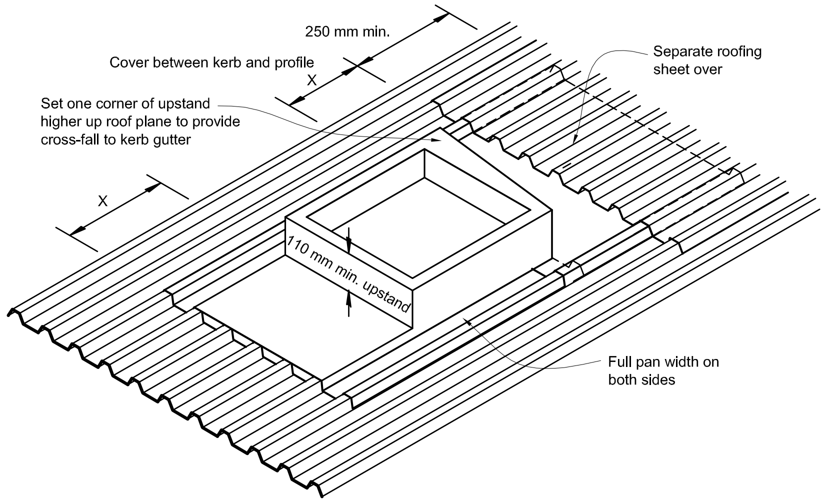
Figure 6: **Flashing for pipes, cables and other penetrations**
Paragraphs 5.2.4 and 5.2.5 a)



NOTE:
(1) Max. roof pitch for this flashing 45°, °
minimum pitch 10°. °
(2) For pipes up to 60mm diameter

Figure 7: **Soaker flashings for penetrations (profiled metal roofs)**
Paragraph 5.2.5 b)

NOTE: (1) X = 200 mm min.
(2) Suitable for penetrations up to 1200 mm wide.
(3) Suitable only for roof pitches of 10° or higher.



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Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)

SOLAR WATER HEATERS

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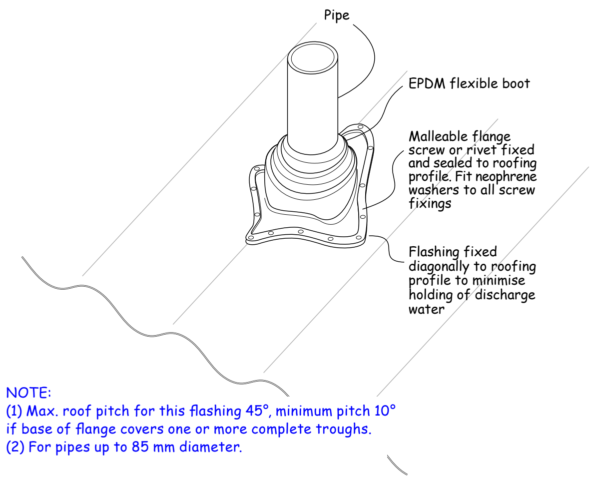
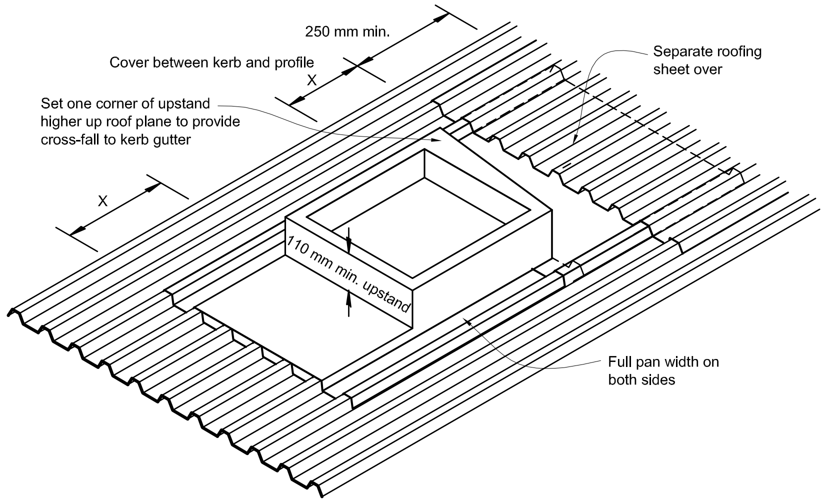
Figure 6: **Flashing for pipes, cables and other penetrations**
Paragraphs 5.2.4 and 5.2.5 a)



NOTE:
(1) Max. roof pitch for this flashing 45°, minimum pitch 10°
if base of flange covers one or more complete troughs.
(2) For pipes up to 85 mm diameter.

Figure 7: **Soaker flashings for penetrations (profiled metal roofs)**
Paragraph 5.2.5 b)

NOTE: (1) X = 200 mm min.
(2) Suitable for penetrations up to 1200 mm wide.
(3) Suitable only for roof pitches of 10° or higher.



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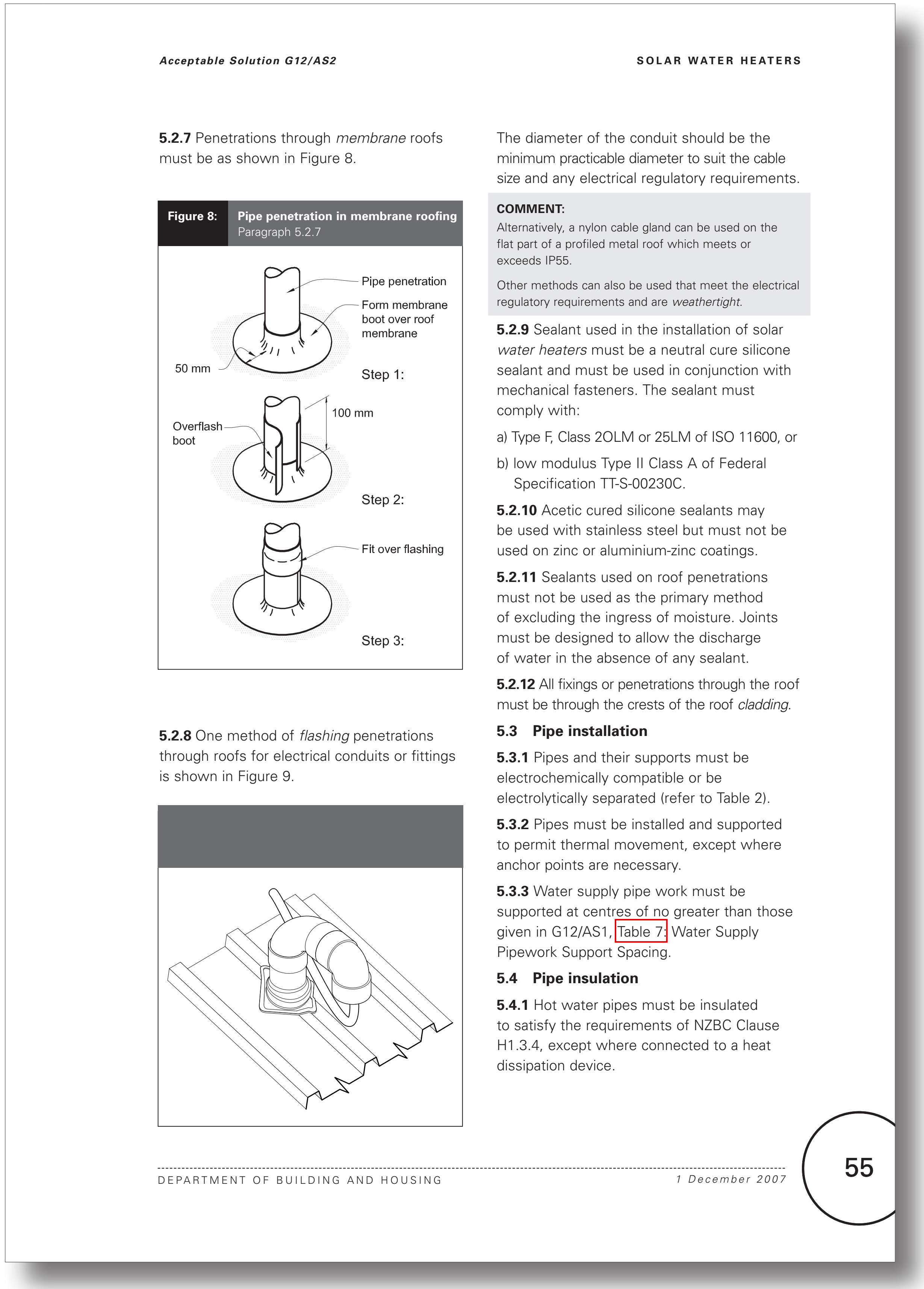
Appendix B. Proposed changes to the acceptable solutions and verification methods for clause G12 Water Supplies

Current G12 Water Supplies acceptable solutions and verification methods

(Text to be amended shown in red)



5.2.7 Penetrations through *membrane* roofs must be as shown in Figure 8.

Figure 8: **Pipe penetration in membrane roofing**
Paragraph 5.2.7

5.2.8 One method of *flashing* penetrations through roofs for electrical conduits or fittings is shown in Figure 9.

The diameter of the conduit should be the minimum practicable diameter to suit the cable size and any electrical regulatory requirements.

COMMENT:

Alternatively, a nylon cable gland can be used on the flat part of a profiled metal roof which meets or exceeds IP55.

Other methods can also be used that meet the electrical regulatory requirements and are *weathertight*.

5.2.9 Sealant used in the installation of solar *water heaters* must be a neutral cure silicone sealant and must be used in conjunction with mechanical fasteners. The sealant must comply with:

a) Type F, Class 2OLM or 25LM of ISO 11600, or

b) low modulus Type II Class A of Federal Specification TT-S-00230C.

5.2.10 Acetic cured silicone sealants may be used with stainless steel but must not be used on zinc or aluminium-zinc coatings.

5.2.11 Sealants used on roof penetrations must not be used as the primary method of excluding the ingress of moisture. Joints must be designed to allow the discharge of water in the absence of any sealant.

5.2.12 All fixings or penetrations through the roof must be through the crests of the roof *cladding*.

5.3 Pipe installation

5.3.1 Pipes and their supports must be electrochemically compatible or be electrolytically separated (refer to Table 2).

5.3.2 Pipes must be installed and supported to permit thermal movement, except where anchor points are necessary.

5.3.3 Water supply pipe work must be supported at centres of no greater than those given in G12/AS1, Table 7: Water Supply Pipework Support Spacing.

5.4 Pipe insulation

5.4.1 Hot water pipes must be insulated to satisfy the requirements of NZBC Clause H1.3.4, except where connected to a heat dissipation device.

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods

(Proposed text in blue)

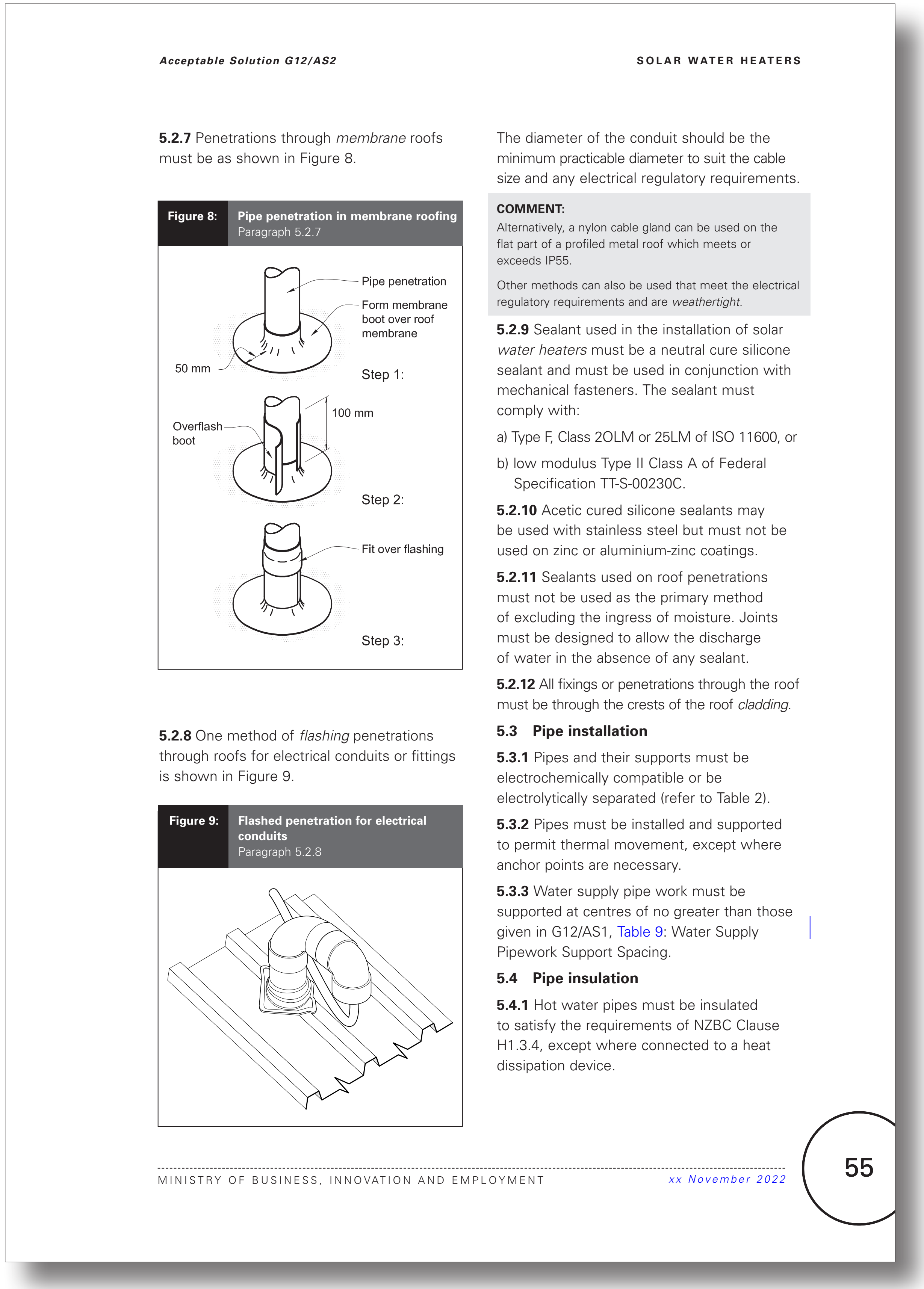


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Figure 8: **Pipe penetration in membrane roofing**
Paragraph 5.2.7

5.2.8 One method of *flashing* penetrations through roofs for electrical conduits or fittings is shown in Figure 9.

Figure 9: **Flashed penetration for electrical conduits**
Paragraph 5.2.8

The diameter of the conduit should be the minimum practicable diameter to suit the cable size and any electrical regulatory requirements.

COMMENT:

Alternatively, a nylon cable gland can be used on the flat part of a profiled metal roof which meets or exceeds IP55.

Other methods can also be used that meet the electrical regulatory requirements and are *weathertight*.

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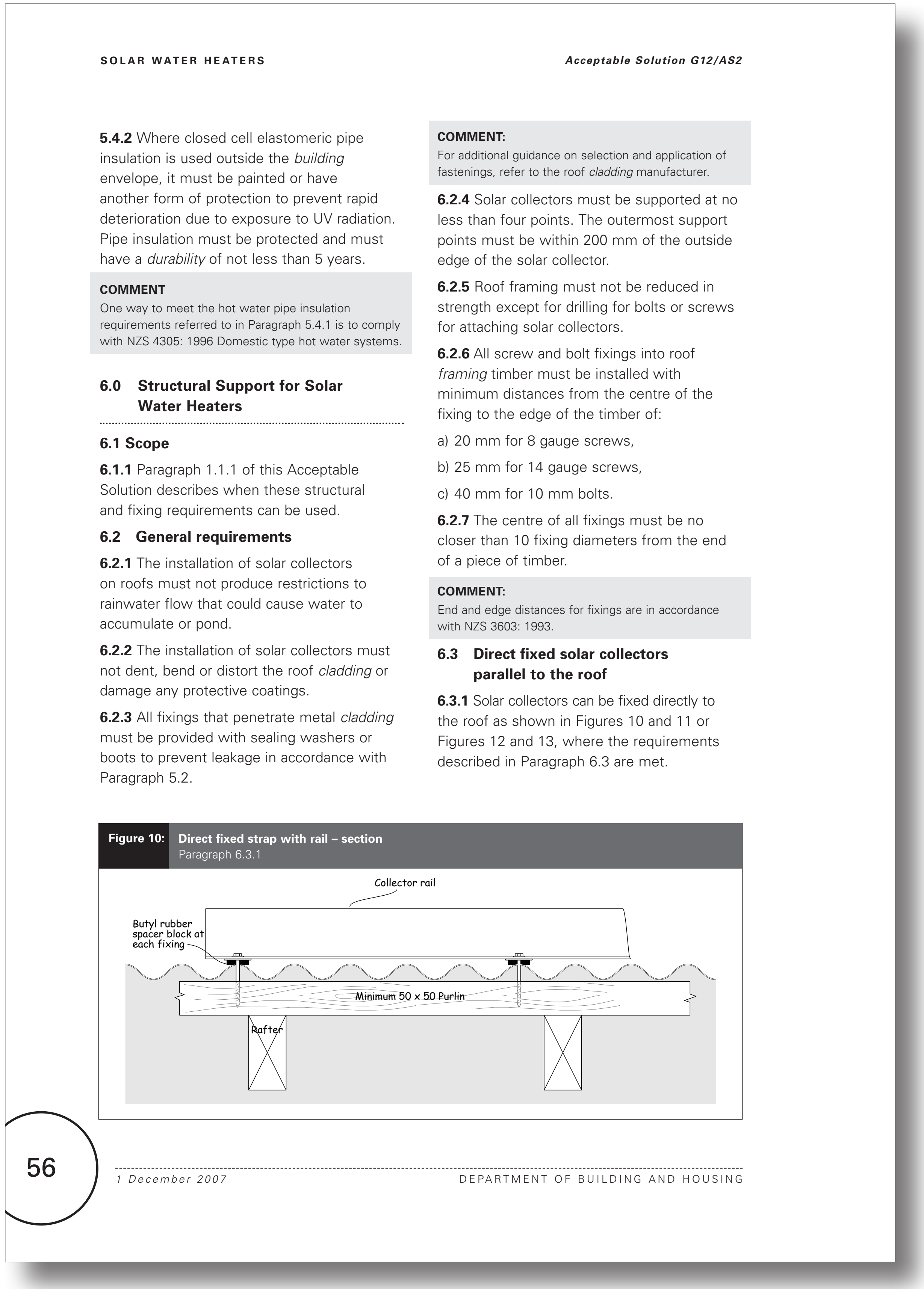

5.4.2 Where closed cell elastomeric pipe insulation is used outside the *building* envelope, it must be painted or have another form of protection to prevent rapid deterioration due to exposure to UV radiation. Pipe insulation must be protected and must have a *durability* of not less than 5 years.

COMMENT
One way to meet the hot water pipe insulation requirements referred to in Paragraph 5.4.1 is to comply with NZS 4305: 1996 Domestic type hot water systems.

6.0 Structural Support for Solar Water Heaters

6.1 Scope

6.1.1 Paragraph 1.1.1 of this Acceptable Solution describes when these structural and fixing requirements can be used.

6.2 General requirements

6.2.1 The installation of solar collectors on roofs must not produce restrictions to rainwater flow that could cause water to accumulate or pond.

6.2.2 The installation of solar collectors must not dent, bend or distort the roof *cladding* or damage any protective coatings.

6.2.3 All fixings that penetrate metal *cladding* must be provided with sealing washers or boots to prevent leakage in accordance with Paragraph 5.2.

COMMENT:
For additional guidance on selection and application of fastenings, refer to the roof *cladding* manufacturer.

6.2.4 Solar collectors must be supported at no less than four points. The outermost support points must be within 200 mm of the outside edge of the solar collector.

6.2.5 Roof framing must not be reduced in strength except for drilling for bolts or screws for attaching solar collectors.

6.2.6 All screw and bolt fixings into roof *framing* timber must be installed with minimum distances from the centre of the fixing to the edge of the timber of:

a) 20 mm for 8 gauge screws,

b) 25 mm for 14 gauge screws,

c) 40 mm for 10 mm bolts.

6.2.7 The centre of all fixings must be no closer than 10 fixing diameters from the end of a piece of timber.

COMMENT:
End and edge distances for fixings are in accordance with NZS 3603: 1993.

6.3 Direct fixed solar collectors parallel to the roof

6.3.1 Solar collectors can be fixed directly to the roof as shown in Figures 10 and 11 or Figures 12 and 13, where the requirements described in Paragraph 6.3 are met.

Figure 10: Direct fixed strap with rail – section
Paragraph 6.3.1

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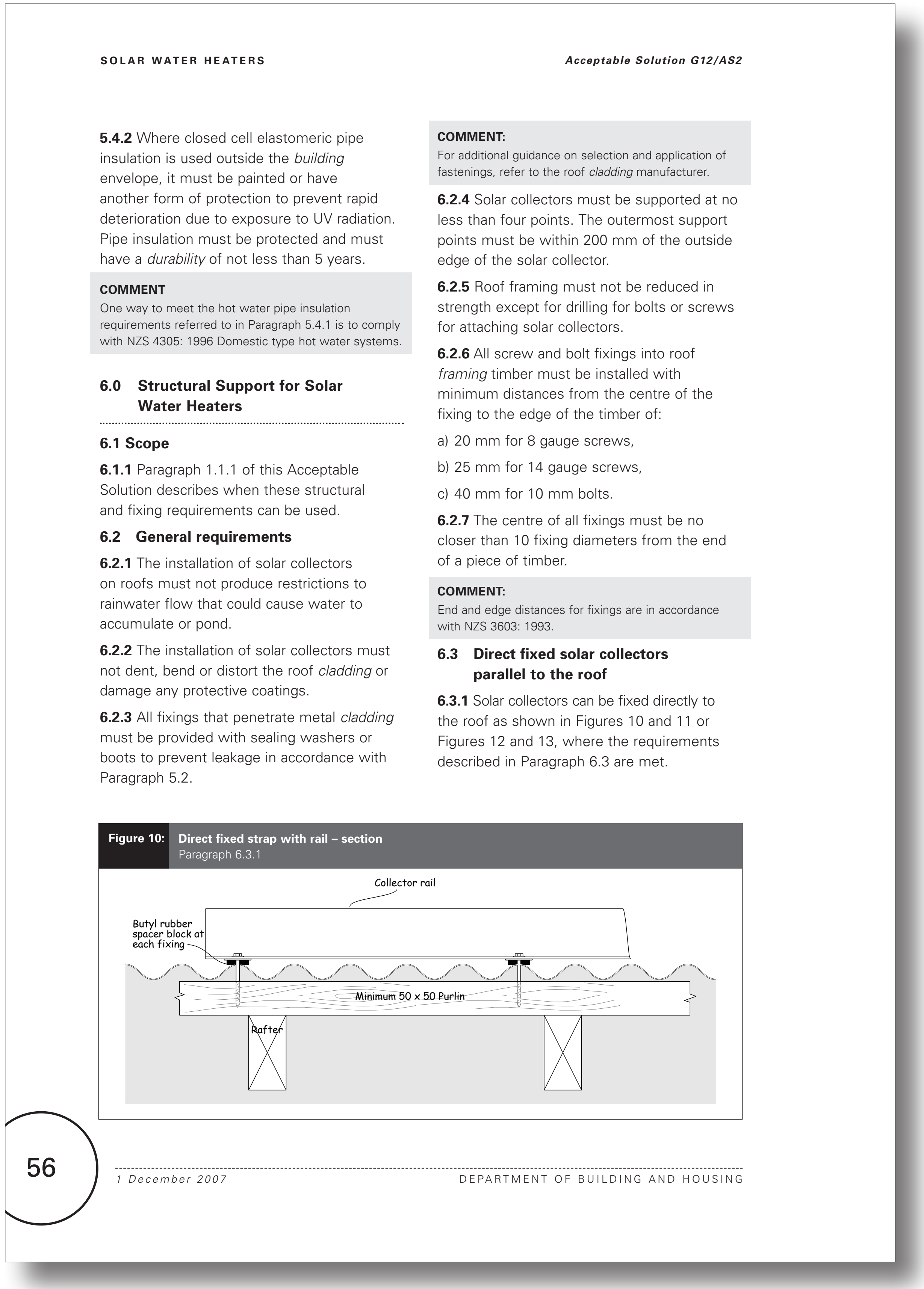

SOLAR WATER HEATERS Acceptable Solution G12/AS2

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a) 20 mm for 8 gauge screws,

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c) 40 mm for 10 mm bolts.

6.2.7 The centre of all fixings must be no closer than 10 fixing diameters from the end of a piece of timber.

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Figure 10: Direct fixed strap with rail – section
Paragraph 6.3.1

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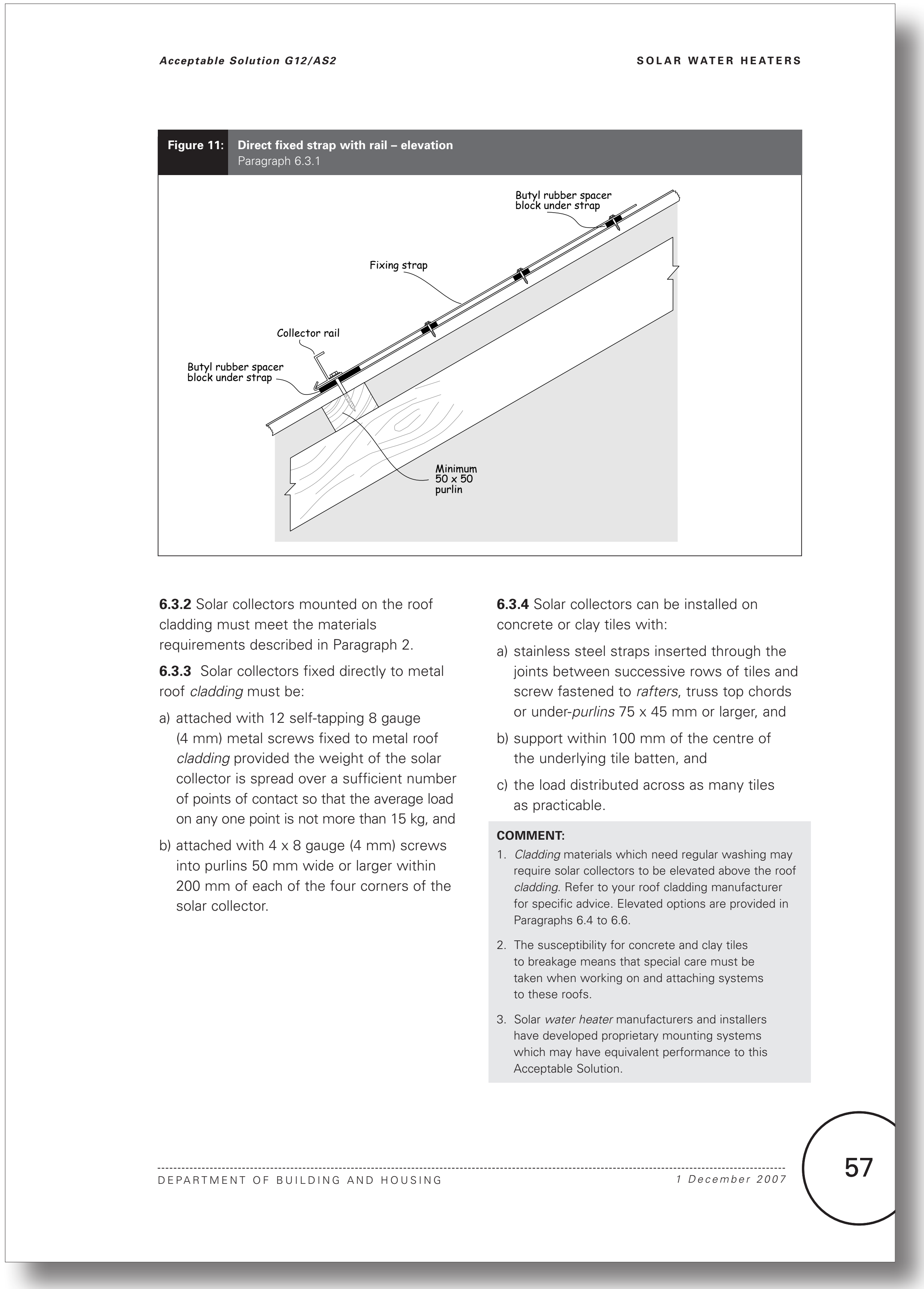

Figure 11: **Direct fixed strap with rail – elevation**
Paragraph 6.3.1

6.3.2 Solar collectors mounted on the roof cladding must meet the materials requirements described in Paragraph 2.

6.3.3 Solar collectors fixed directly to metal roof *cladding* must be:

a) attached with 12 self-tapping 8 gauge (4 mm) metal screws fixed to metal roof *cladding* provided the weight of the solar collector is spread over a sufficient number of points of contact so that the average load on any one point is not more than 15 kg, and

b) attached with 4 x 8 gauge (4 mm) screws into purlins 50 mm wide or larger within 200 mm of each of the four corners of the solar collector.

6.3.4 Solar collectors can be installed on concrete or clay tiles with:

a) stainless steel straps inserted through the joints between successive rows of tiles and screw fastened to *rafters*, truss top chords or under-*purlins* 75 x 45 mm or larger, and

b) support within 100 mm of the centre of the underlying tile batten, and

c) the load distributed across as many tiles as practicable.

COMMENT:

1. *Cladding* materials which need regular washing may require solar collectors to be elevated above the roof *cladding*. Refer to your roof cladding manufacturer for specific advice. Elevated options are provided in Paragraphs 6.4 to 6.6.
2. The susceptibility for concrete and clay tiles to breakage means that special care must be taken when working on and attaching systems to these roofs.
3. Solar *water heater* manufacturers and installers have developed proprietary mounting systems which may have equivalent performance to this Acceptable Solution.

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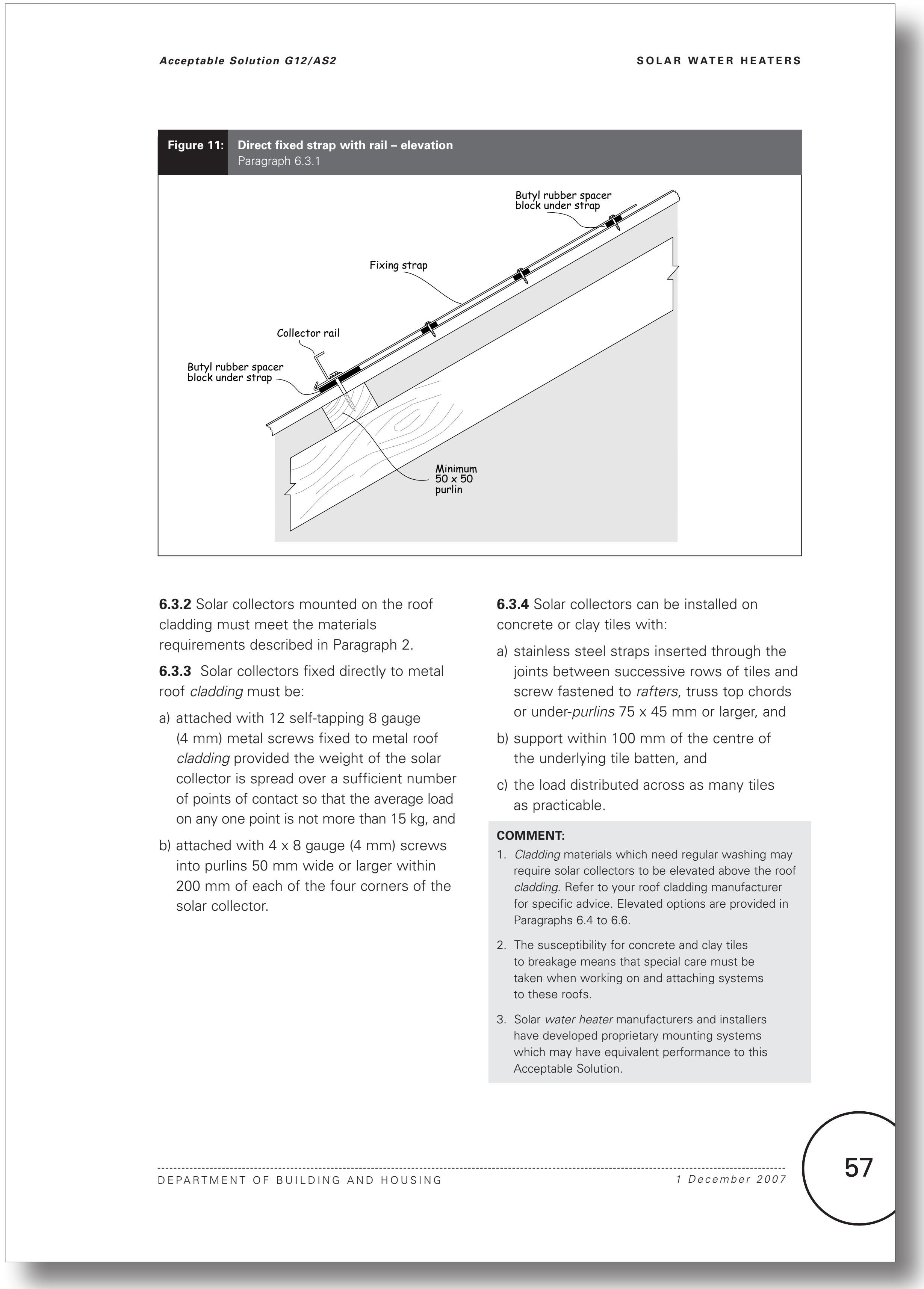

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Figure 11: **Direct fixed strap with rail – elevation**
Paragraph 6.3.1

6.3.2 Solar collectors mounted on the roof cladding must meet the materials requirements described in Paragraph 2.

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b) attached with 4 x 8 gauge (4 mm) screws into purlins 50 mm wide or larger within 200 mm of each of the four corners of the solar collector.

6.3.4 Solar collectors can be installed on concrete or clay tiles with:

a) stainless steel straps inserted through the joints between successive rows of tiles and screw fastened to *rafters*, truss top chords or under-*purlins* 75 x 45 mm or larger, and

b) support within 100 mm of the centre of the underlying tile batten, and

c) the load distributed across as many tiles as practicable.

COMMENT:

1. *Cladding* materials which need regular washing may require solar collectors to be elevated above the roof *cladding*. Refer to your roof cladding manufacturer for specific advice. Elevated options are provided in Paragraphs 6.4 to 6.6.
2. The susceptibility for concrete and clay tiles to breakage means that special care must be taken when working on and attaching systems to these roofs.
3. Solar *water heater* manufacturers and installers have developed proprietary mounting systems which may have equivalent performance to this Acceptable Solution.

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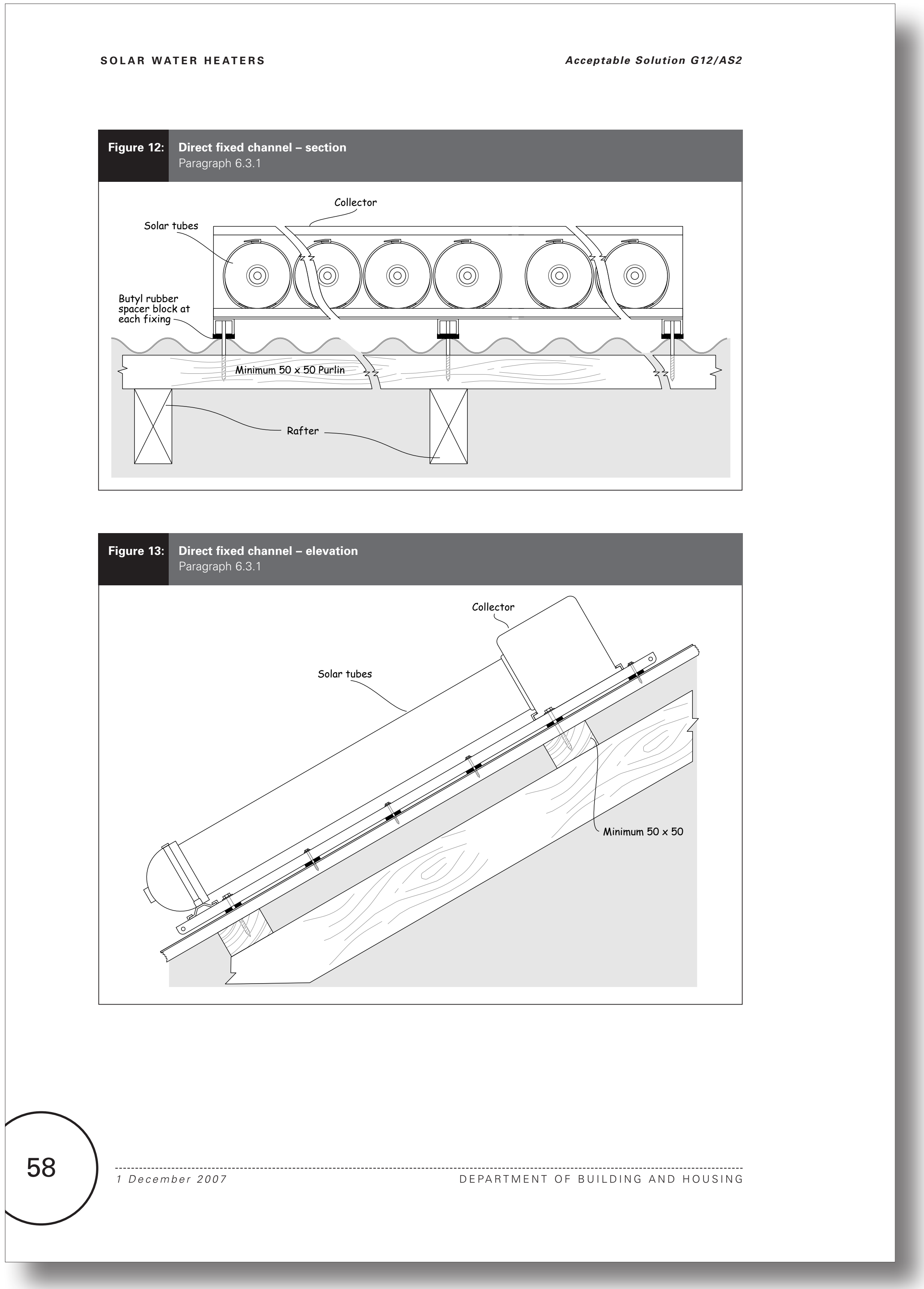

Figure 12: **Direct fixed channel – section**
Paragraph 6.3.1

Figure 13: **Direct fixed channel – elevation**
Paragraph 6.3.1

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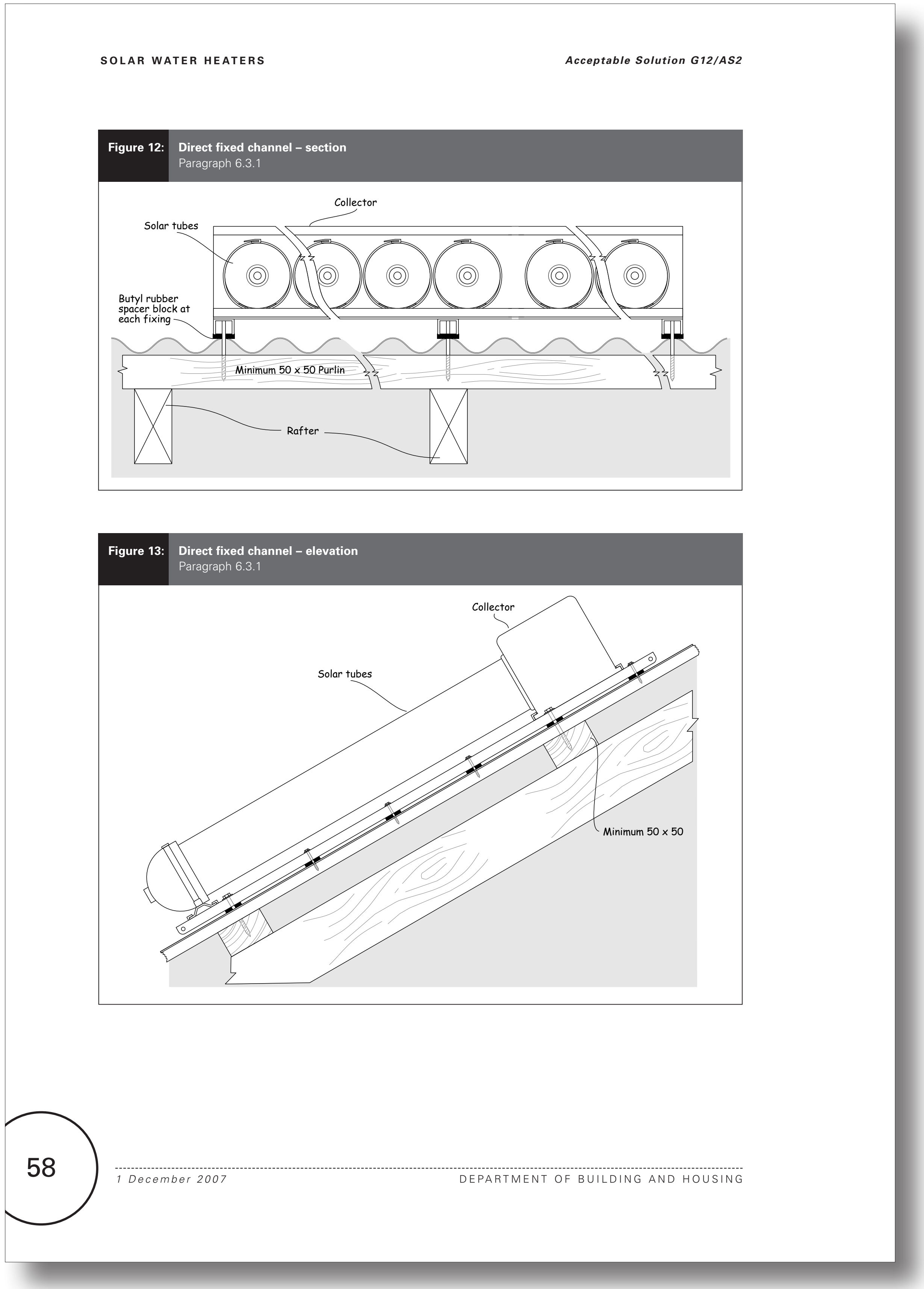

SOLAR WATER HEATERS Acceptable Solution G12/AS2

Figure 12: Direct fixed channel – section
Paragraph 6.3.1

Collector
Solar tubes
Butyl rubber spacer block at each fixing
Minimum 50 x 50 Purlin
Rafter

Figure 13: Direct fixed channel – elevation
Paragraph 6.3.1

Collector
Solar tubes
Minimum 50 x 50

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6.4 Elevated solar collector panels parallel to the roof

6.4.1 Solar collectors mounted parallel to the roof that are elevated up to 50 mm above the roof *cladding* must be fixed:

a) as shown in Figure 14, with 14 gauge screws into one of the following:
   - i) *purlins* 70 x 45 mm or larger on their flat, that span no more than 700 mm, or
   - ii) *purlins* 90 x 45 mm or larger on their flat, that span no more than 900 mm, or
   - iii) *rafters* 90 x 45 mm or larger, or
   - iv) truss top chords 90 x 45 mm or larger, or

b) as shown in Figure 15, with 10 mm hot dip galvanised bolts to *purlins* 90 x 45 mm or larger that span no more than 900 mm, or

c) as shown in Figure 16, with 12 mm bolts welded to 3 mm plate, hot dip galvanised after welding and screw fixed to either:
   - i) *rafters*, or
   - ii) truss top chords.

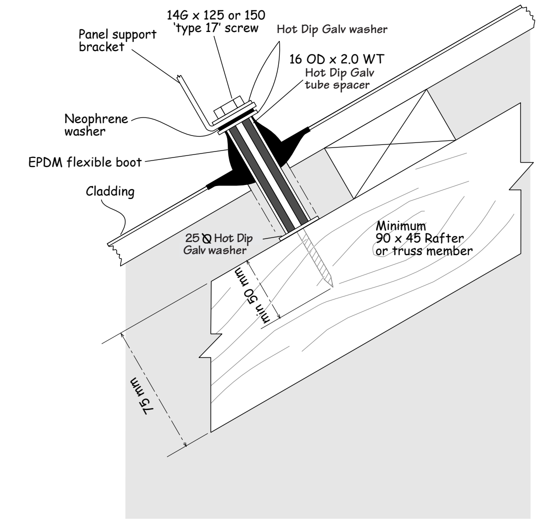
6.4.2 Solar collectors mounted parallel to the roof that are elevated up to 50 mm above the roof *cladding* must be supported by:

a) underlying *purlins* conforming to Paragraph 6.4.1 (a) or (b), or

b) underlying *rafters* or trusses with connections conforming with Paragraphs 6.4.1 (a) or (c), or

c) collector support rails conforming to Paragraph 6.5.

Figure 14: **Screw fixing**
Paragraph 6.4.1 b)



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Acceptable Solution G12/AS2 SOLAR WATER HEATERS

6.4 Elevated solar collector panels parallel to the roof

6.4.1 Solar collectors mounted parallel to the roof that are elevated up to 50 mm above the roof *cladding* must be fixed:

a) as shown in Figure 14, with 14 gauge screws into one of the following:
   - i) *purlins* 70 x 45 mm or larger on their flat, that span no more than 700 mm, or
   - ii) *purlins* 90 x 45 mm or larger on their flat, that span no more than 900 mm, or
   - iii) *rafters* 90 x 45 mm or larger, or
   - iv) truss top chords 90 x 45 mm or larger, or

b) as shown in Figure 15, with 10 mm hot dip galvanised bolts to *purlins* 90 x 45 mm or larger that span no more than 900 mm, or

c) as shown in Figure 16, with 12 mm bolts welded to 3 mm plate, hot dip galvanised after welding and screw fixed to either:
   - i) *rafters*, or
   - ii) truss top chords.

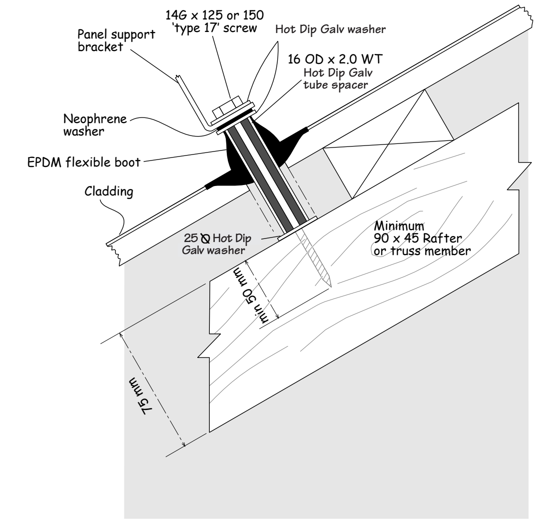
6.4.2 Solar collectors mounted parallel to the roof that are elevated up to 50 mm above the roof *cladding* must be supported by:

a) underlying *purlins* conforming to Paragraph 6.4.1 (a) or (b), or

b) underlying *rafters* or trusses with connections conforming with Paragraphs 6.4.1 (a) or (c), or

c) collector support rails conforming to Paragraph 6.5.

Figure 14: **Screw fixing**
Paragraph 6.4.1 b)



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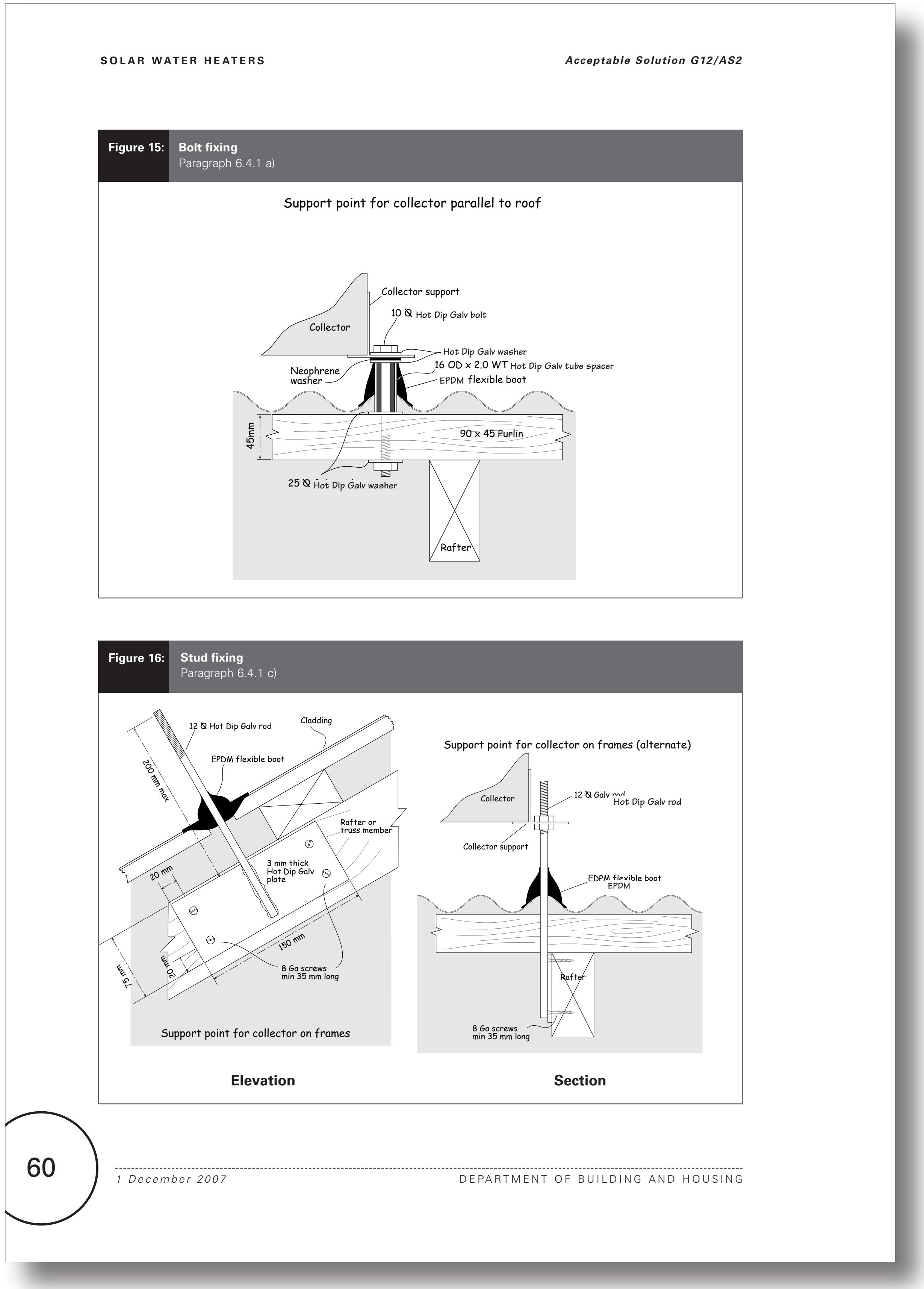

SOLAR WATER HEATERS

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Figure 15: **Bolt fixing**
Paragraph 6.4.1 a)

Figure 16: **Stud fixing**
Paragraph 6.4.1 c)

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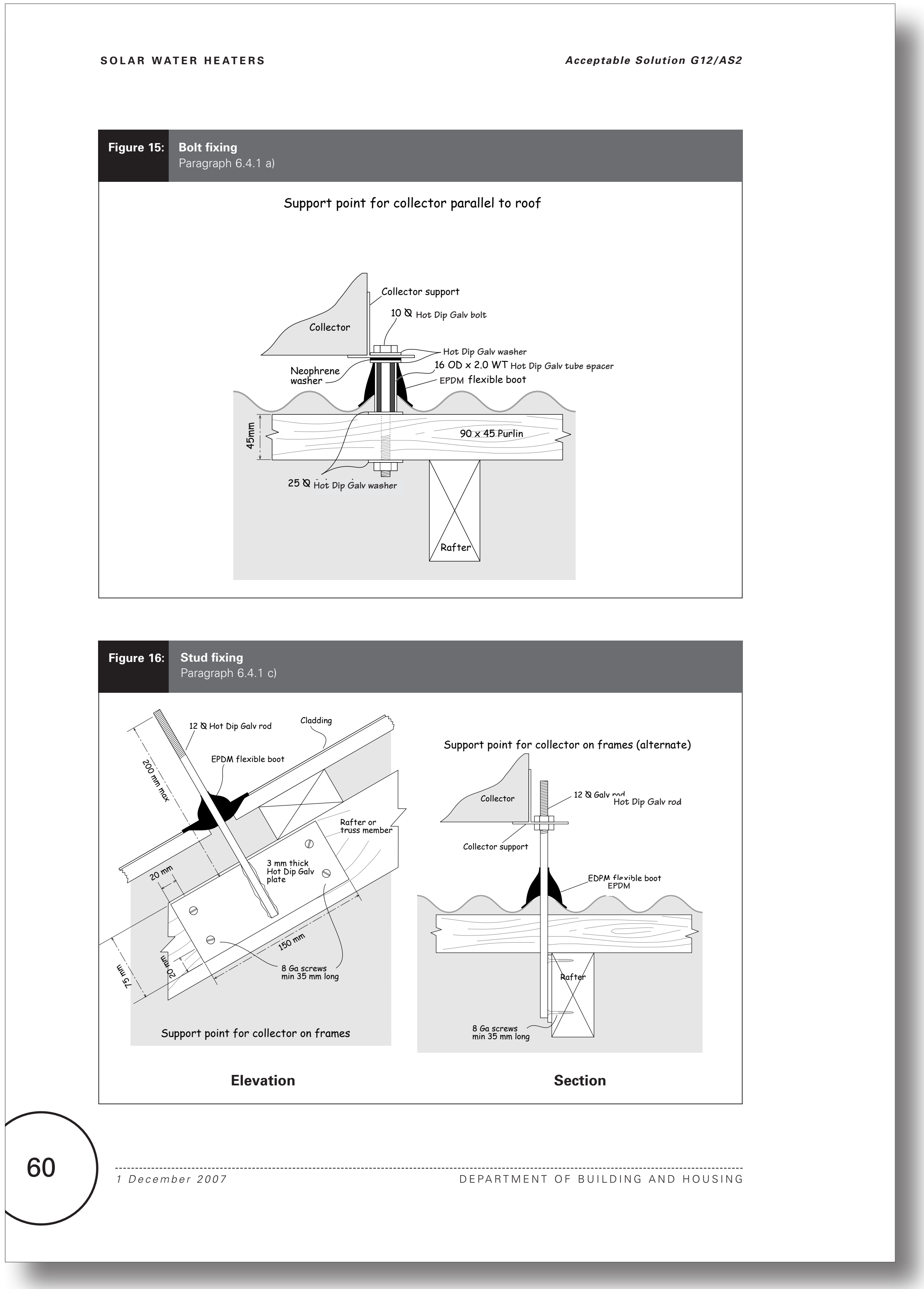

SOLAR WATER HEATERS

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Figure 15: **Bolt fixing**
Paragraph 6.4.1 a)

Figure 16: **Stud fixing**
Paragraph 6.4.1 c)

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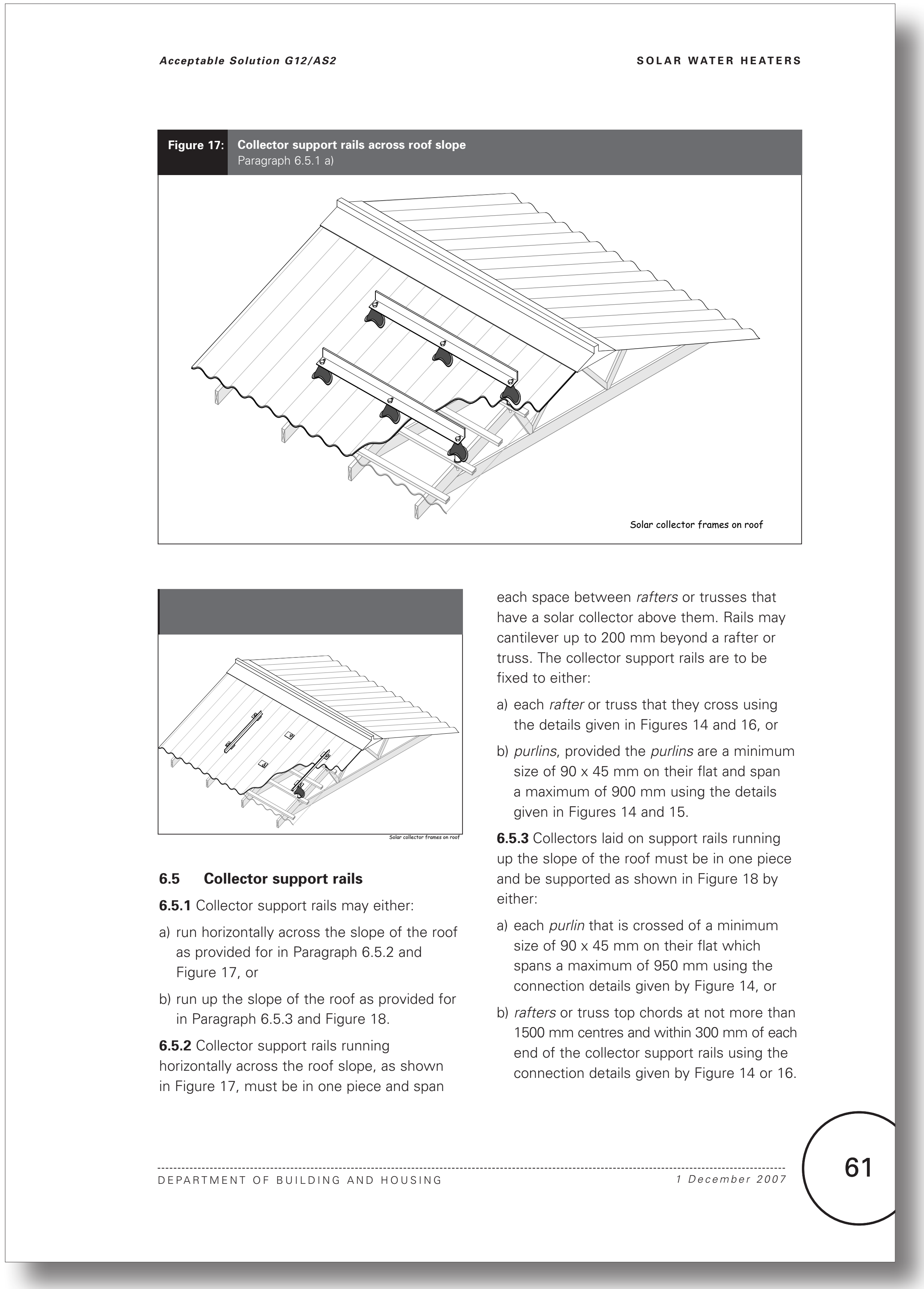

Acceptable Solution G12/AS2 SOLAR WATER HEATERS

Figure 17: **Collector support rails across roof slope**
Paragraph 6.5.1 a)

Solar collector frames on roof

Solar collector frames on roof

6.5 Collector support rails

6.5.1 Collector support rails may either:

a) run horizontally across the slope of the roof as provided for in Paragraph 6.5.2 and Figure 17, or

b) run up the slope of the roof as provided for in Paragraph 6.5.3 and Figure 18.

6.5.2 Collector support rails running horizontally across the roof slope, as shown in Figure 17, must be in one piece and span each space between *rafters* or trusses that have a solar collector above them. Rails may cantilever up to 200 mm beyond a rafter or truss. The collector support rails are to be fixed to either:

a) each *rafter* or truss that they cross using the details given in Figures 14 and 16, or

b) *purlins*, provided the *purlins* are a minimum size of 90 x 45 mm on their flat and span a maximum of 900 mm using the details given in Figures 14 and 15.

6.5.3 Collectors laid on support rails running up the slope of the roof must be in one piece and be supported as shown in Figure 18 by either:

a) each *purlin* that is crossed of a minimum size of 90 x 45 mm on their flat which spans a maximum of 950 mm using the connection details given by Figure 14, or

b) *rafters* or truss top chords at not more than 1500 mm centres and within 300 mm of each end of the collector support rails using the connection details given by Figure 14 or 16.

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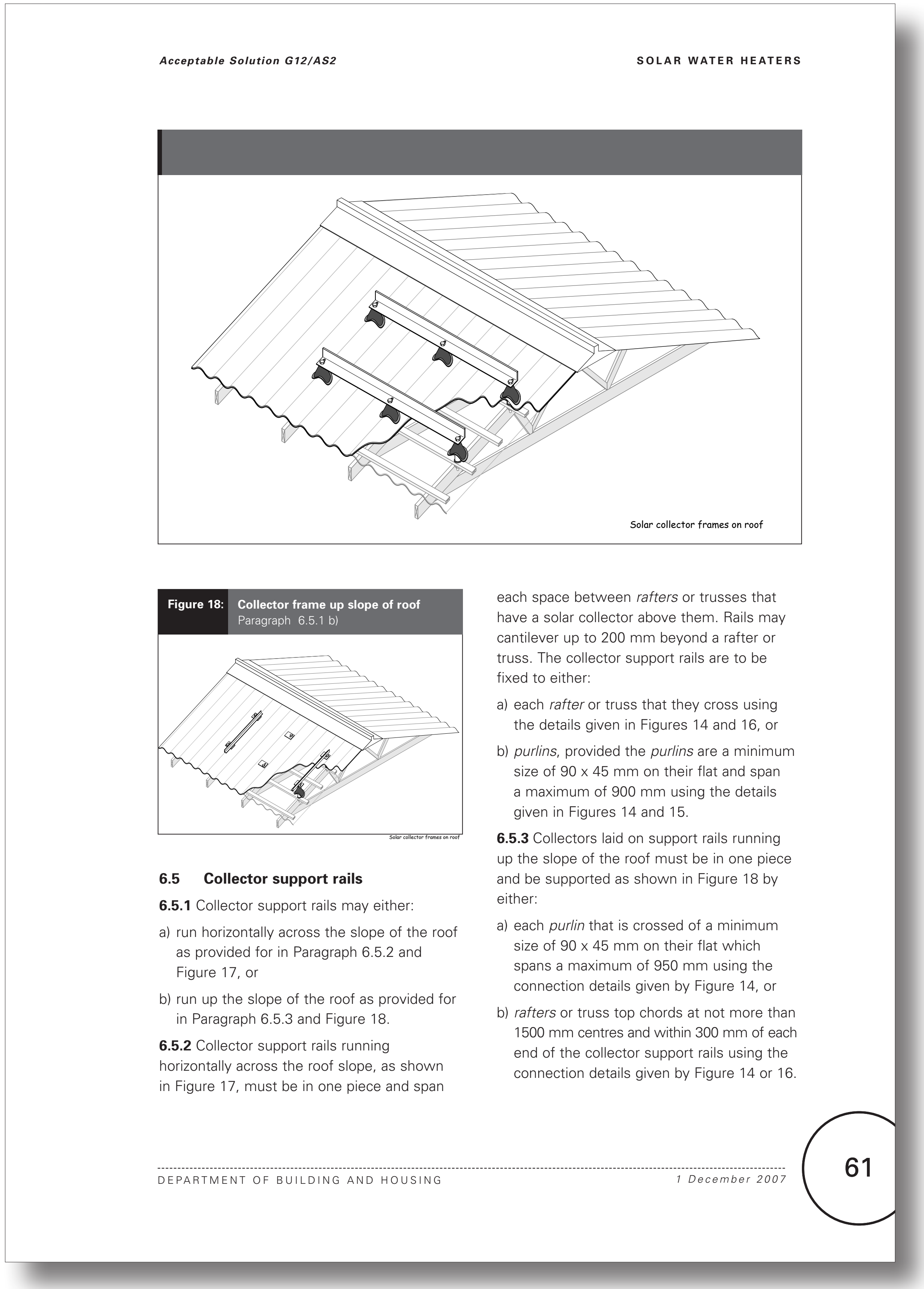
Proposed G12 Water Supplies - No changes proposed to this page



Acceptable Solution G12/AS2 SOLAR WATER HEATERS

Solar collector frames on roof

Figure 18: **Collector frame up slope of roof**
Paragraph 6.5.1 b)

Solar collector frames on roof

6.5 Collector support rails

6.5.1 Collector support rails may either:

a) run horizontally across the slope of the roof as provided for in Paragraph 6.5.2 and Figure 17, or

b) run up the slope of the roof as provided for in Paragraph 6.5.3 and Figure 18.

6.5.2 Collector support rails running horizontally across the roof slope, as shown in Figure 17, must be in one piece and span each space between *rafters* or trusses that have a solar collector above them. Rails may cantilever up to 200 mm beyond a rafter or truss. The collector support rails are to be fixed to either:

a) each *rafter* or truss that they cross using the details given in Figures 14 and 16, or

b) *purlins*, provided the *purlins* are a minimum size of 90 x 45 mm on their flat and span a maximum of 900 mm using the details given in Figures 14 and 15.

6.5.3 Collectors laid on support rails running up the slope of the roof must be in one piece and be supported as shown in Figure 18 by either:

a) each *purlin* that is crossed of a minimum size of 90 x 45 mm on their flat which spans a maximum of 950 mm using the connection details given by Figure 14, or

b) *rafters* or truss top chords at not more than 1500 mm centres and within 300 mm of each end of the collector support rails using the connection details given by Figure 14 or 16.

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6.6 Mounting collectors at a different pitch to the roof cladding

6.6.1 Solar collectors mounted at a different pitch to the pitch of the roof must be installed with no less than 8 fixing points and must meet all the requirements described in Paragraph 6.6 and Figure 19.

6.6.2 Solar collectors must be mounted on support rails running horizontally across the roof slope that comply with Paragraph 6.5.2 except for the following differences:

a) they must be supported by four *rafters* or truss top chords, and

b) they must be hot dip galvanised mild steel or stainless steel angles with a minimum section modulus about axes parallel to the sides of the angle of 3.3 cm^3 x 10 mm^3, and

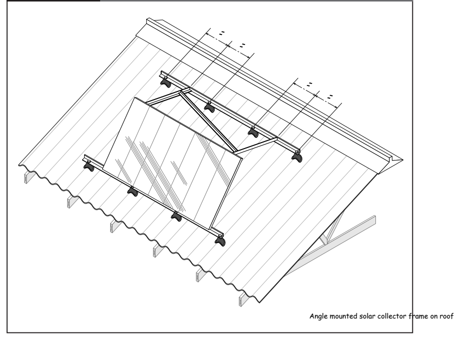
c) they must be connected to the *rafters* or truss top chords with fixings as shown in Figure 20, and

d) the connections between the struts and the collector support rails must be mid-way between the outer pair of collector support rail fixings.

COMMENT:

1. A steel angle section 50 x 50 x 6 mm meets the minimum strength requirements of Paragraph 6.6.2.
2. Other materials can be used for the support rails which meet the materials requirements described in Paragraph 2.0 and have equivalent strength to the rails described in Paragraph 6.6.2 b).

Figure 19: Collector at different pitch to roof
Paragraph 6.6.1



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SOLAR WATER HEATERS Acceptable Solution G12/AS2

6.6 Mounting collectors at a different pitch to the roof cladding

6.6.1 Solar collectors mounted at a different pitch to the pitch of the roof must be installed with no less than 8 fixing points and must meet all the requirements described in Paragraph 6.6 and Figure 19.

6.6.2 Solar collectors must be mounted on support rails running horizontally across the roof slope that comply with Paragraph 6.5.2 except for the following differences:

a) they must be supported by four rafters or truss top chords, and

b) they must be hot dip galvanised mild steel or stainless steel angles with a minimum section modulus about axes parallel to the sides of the angle of 3.3 cm^3 x 10 mm^3, and

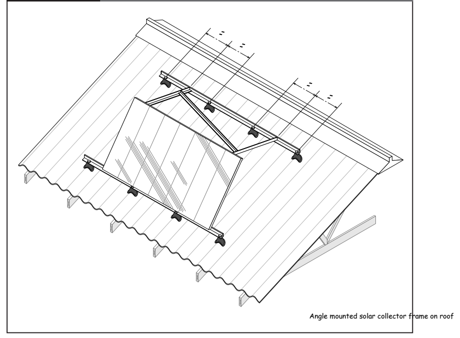
c) they must be connected to the rafters or truss top chords with fixings as shown in Figure 20, and

d) the connections between the struts and the collector support rails must be mid-way between the outer pair of collector support rail fixings.

COMMENT:

1. A steel angle section 50 x 50 x 6 mm meets the minimum strength requirements of Paragraph 6.6.2.
2. Other materials can be used for the support rails which meet the materials requirements described in Paragraph 2.0 and have equivalent strength to the rails described in Paragraph 6.6.2 b).

Figure 19: Collector at different pitch to roof
Paragraph 6.6.1



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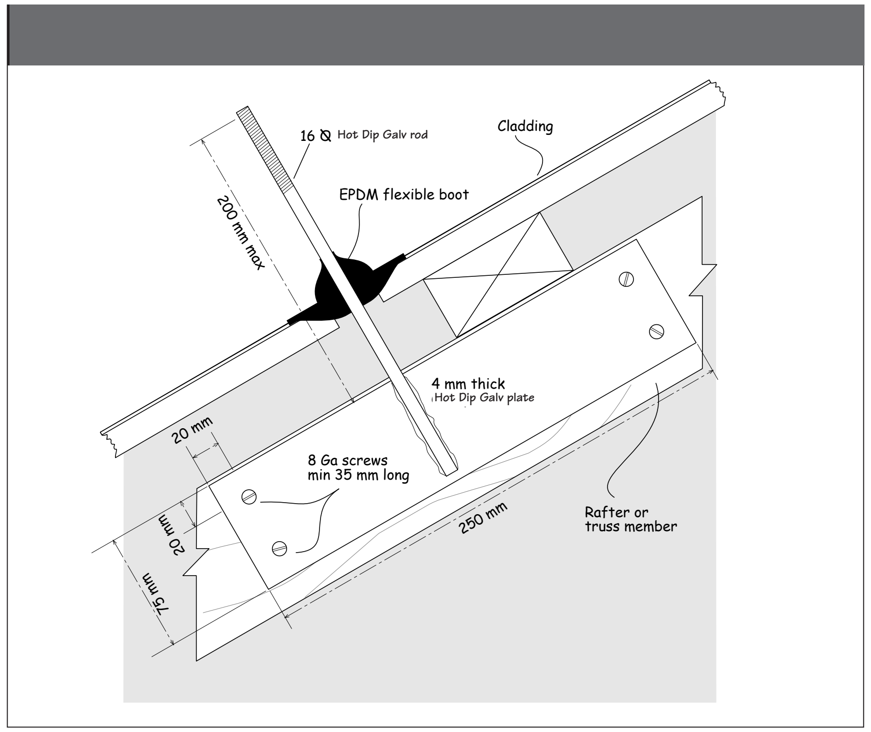


6.6.3 The edge of the panel elevated above the roof plane is to be supported by hot dip galvanized steel or stainless steel angle struts which are:

a) 25 x 25 x 3 mm angle for struts up to 1.0 m long

b) 30 x 30 x 3 mm angle for struts up to 1.4 m long, or

c) 40 x 40 x 3 mm angle for struts up to 2.4 m long.

Cuts or holes made in steel after galvanizing are to be protected from corrosion.

6.6.4 A diagonal is to run from within 50 mm of the top of one strut to within 50 mm of the bottom of the other strut. It must be the same size as the struts.

6.6.5 Connections between the struts, the diagonal and support rails are to be:

a) for hot dip galvanized steel, one M8 hot dip galvanized Class 4.8 bolt with nut and washers at each intersection, or

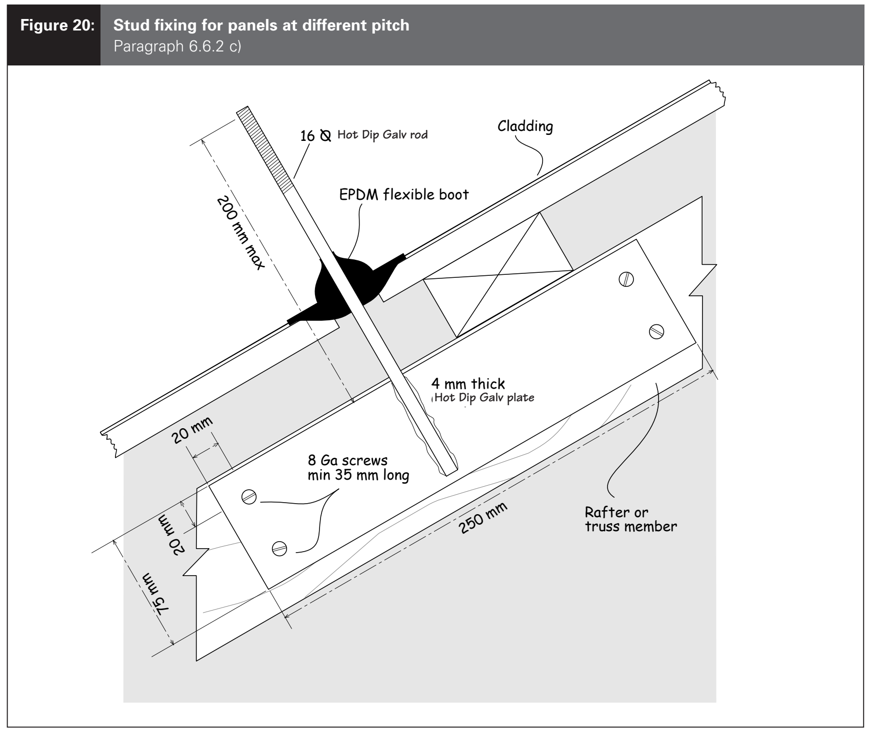
b) for stainless steel, one M8 stainless steel bolt with nut and washers at each intersection, or

c) fully welded – any mild steel that is welded must be hot dip galvanized after welding.

6.6.6 Connections between the upper ends of the struts and the collector must be of equivalent strength to the those of Paragraph 6.6.5

Proposed G12 Water Supplies - No changes proposed to this page

Figure 20: **Stud fixing for panels at different pitch**
Paragraph 6.6.2 c)



6.6.3 The edge of the panel elevated above the roof plane is to be supported by hot dip galvanized steel or stainless steel angle struts which are:

a) 25 x 25 x 3 mm angle for struts up to 1.0 m long

b) 30 x 30 x 3 mm angle for struts up to 1.4 m long, or

c) 40 x 40 x 3 mm angle for struts up to 2.4 m long.

Cuts or holes made in steel after galvanizing are to be protected from corrosion.

6.6.4 A diagonal is to run from within 50 mm of the top of one strut to within 50 mm of the bottom of the other strut. It must be the same size as the struts.

6.6.5 Connections between the struts, the diagonal and support rails are to be:

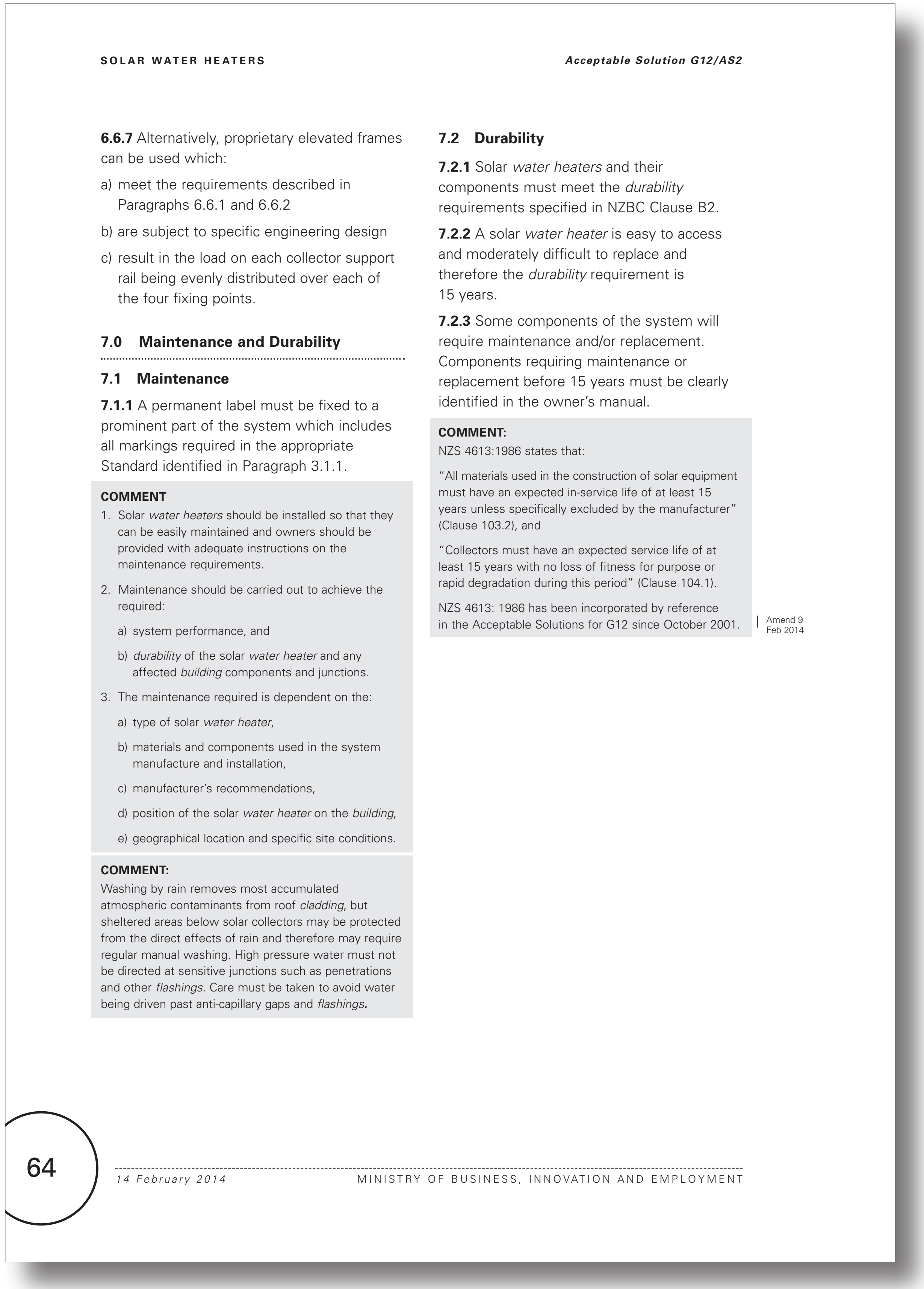
a) for hot dip galvanized steel, one M8 hot dip galvanized Class 4.8 bolt with nut and washers at each intersection, or

b) for stainless steel, one M8 stainless steel bolt with nut and washers at each intersection, or

c) fully welded – any mild steel that is welded must be hot dip galvanized after welding.

6.6.6 Connections between the upper ends of the struts and the collector must be of equivalent strength to the those of Paragraph 6.6.5

Current G12 Water Supplies - No changes proposed to this page



6.6.7 Alternatively, proprietary elevated frames can be used which:

a) meet the requirements described in Paragraphs 6.6.1 and 6.6.2

b) are subject to specific engineering design

c) result in the load on each collector support rail being evenly distributed over each of the four fixing points.

7.0 Maintenance and Durability

7.1 Maintenance

7.1.1 A permanent label must be fixed to a prominent part of the system which includes all markings required in the appropriate Standard identified in Paragraph 3.1.1.

COMMENT

1. Solar *water heaters* should be installed so that they can be easily maintained and owners should be provided with adequate instructions on the maintenance requirements.
2. Maintenance should be carried out to achieve the required:
   a) system performance, and
   b) *durability* of the solar *water heater* and any affected *building* components and junctions.
3. The maintenance required is dependent on the:
   a) type of solar *water heater*,
   b) materials and components used in the system manufacture and installation,
   c) manufacturer's recommendations,
   d) position of the solar *water heater* on the *building*,
   e) geographical location and specific site conditions.

COMMENT:

Washing by rain removes most accumulated atmospheric contaminants from roof *cladding*, but sheltered areas below solar collectors may be protected from the direct effects of rain and therefore may require regular manual washing. High pressure water must not be directed at sensitive junctions such as penetrations and other *flashings*. Care must be taken to avoid water being driven past anti-capillary gaps and *flashings.*

7.2 Durability

7.2.1 Solar *water heaters* and their components must meet the *durability* requirements specified in NZBC Clause B2.

7.2.2 A solar *water heater* is easy to access and moderately difficult to replace and therefore the *durability* requirement is 15 years.

7.2.3 Some components of the system will require maintenance and/or replacement. Components requiring maintenance or replacement before 15 years must be clearly identified in the owner's manual.

COMMENT:

NZS 4613:1986 states that:

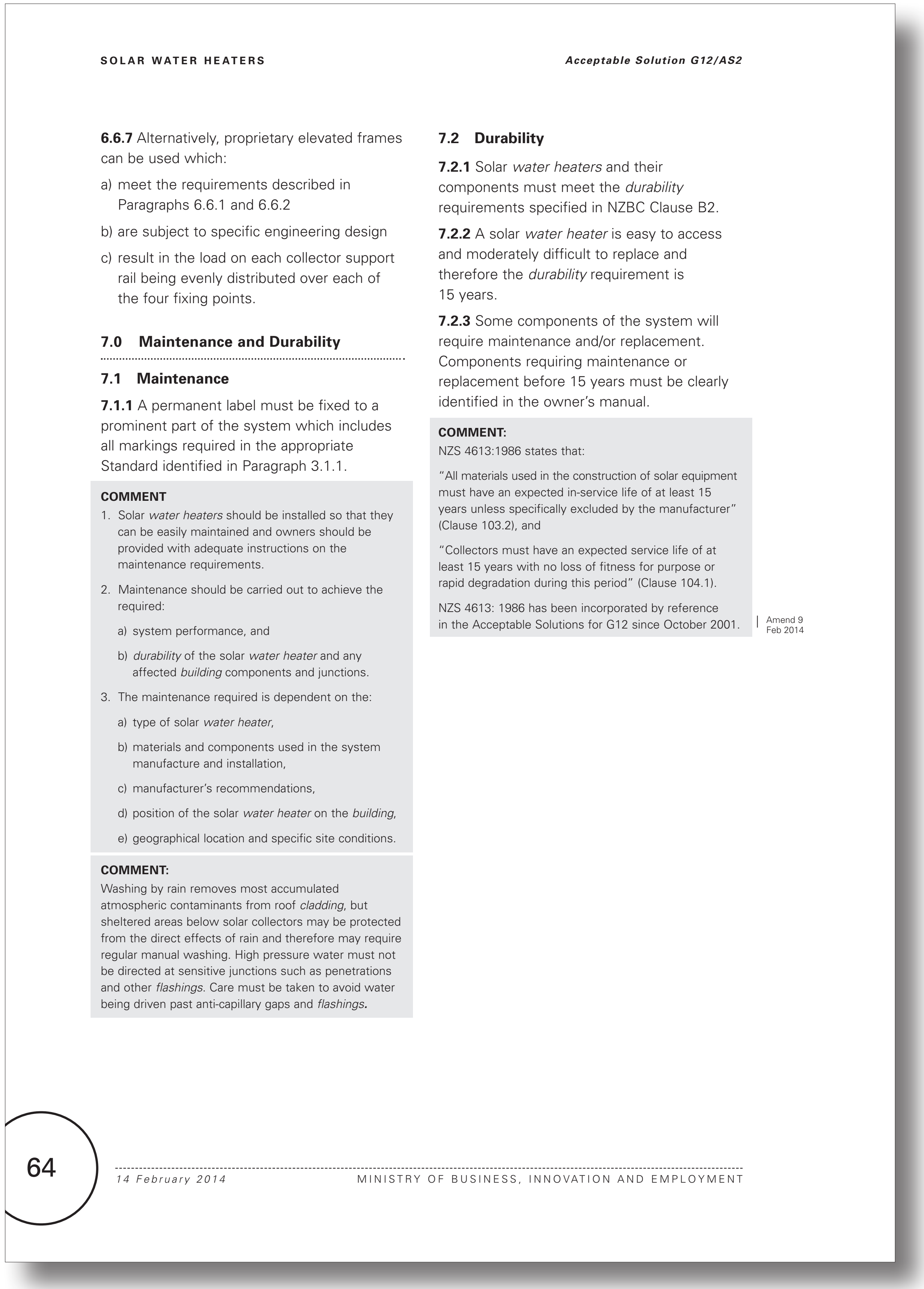
"All materials used in the construction of solar equipment must have an expected in-service life of at least 15 years unless specifically excluded by the manufacturer" (Clause 103.2), and

"Collectors must have an expected service life of at least 15 years with no loss of fitness for purpose or rapid degradation during this period" (Clause 104.1).

NZS 4613: 1986 has been incorporated by reference in the Acceptable Solutions for G12 since October 2001.

Amend 9 Feb 2014

Proposed G12 Water Supplies - No changes proposed to this page



SOLAR WATER HEATERS Acceptable Solution G12/AS2

6.6.7 Alternatively, proprietary elevated frames can be used which:

a) meet the requirements described in Paragraphs 6.6.1 and 6.6.2

b) are subject to specific engineering design

c) result in the load on each collector support rail being evenly distributed over each of the four fixing points.

7.0 Maintenance and Durability

7.1 Maintenance

7.1.1 A permanent label must be fixed to a prominent part of the system which includes all markings required in the appropriate Standard identified in Paragraph 3.1.1.

COMMENT

1. Solar *water heaters* should be installed so that they can be easily maintained and owners should be provided with adequate instructions on the maintenance requirements.
2. Maintenance should be carried out to achieve the required:
   a) system performance, and
   b) *durability* of the solar *water heater* and any affected *building* components and junctions.
3. The maintenance required is dependent on the:
   a) type of solar *water heater*,
   b) materials and components used in the system manufacture and installation,
   c) manufacturer's recommendations,
   d) position of the solar *water heater* on the *building*,
   e) geographical location and specific site conditions.

COMMENT:

Washing by rain removes most accumulated atmospheric contaminants from roof *cladding*, but sheltered areas below solar collectors may be protected from the direct effects of rain and therefore may require regular manual washing. High pressure water must not be directed at sensitive junctions such as penetrations and other *flashings*. Care must be taken to avoid water being driven past anti-capillary gaps and *flashings.*

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7.2.3 Some components of the system will require maintenance and/or replacement. Components requiring maintenance or replacement before 15 years must be clearly identified in the owner's manual.

COMMENT:

NZS 4613:1986 states that:

"All materials used in the construction of solar equipment must have an expected in-service life of at least 15 years unless specifically excluded by the manufacturer" (Clause 103.2), and

"Collectors must have an expected service life of at least 15 years with no loss of fitness for purpose or rapid degradation during this period" (Clause 104.1).

NZS 4613: 1986 has been incorporated by reference in the Acceptable Solutions for G12 since October 2001.

Amend 9 Feb 2014

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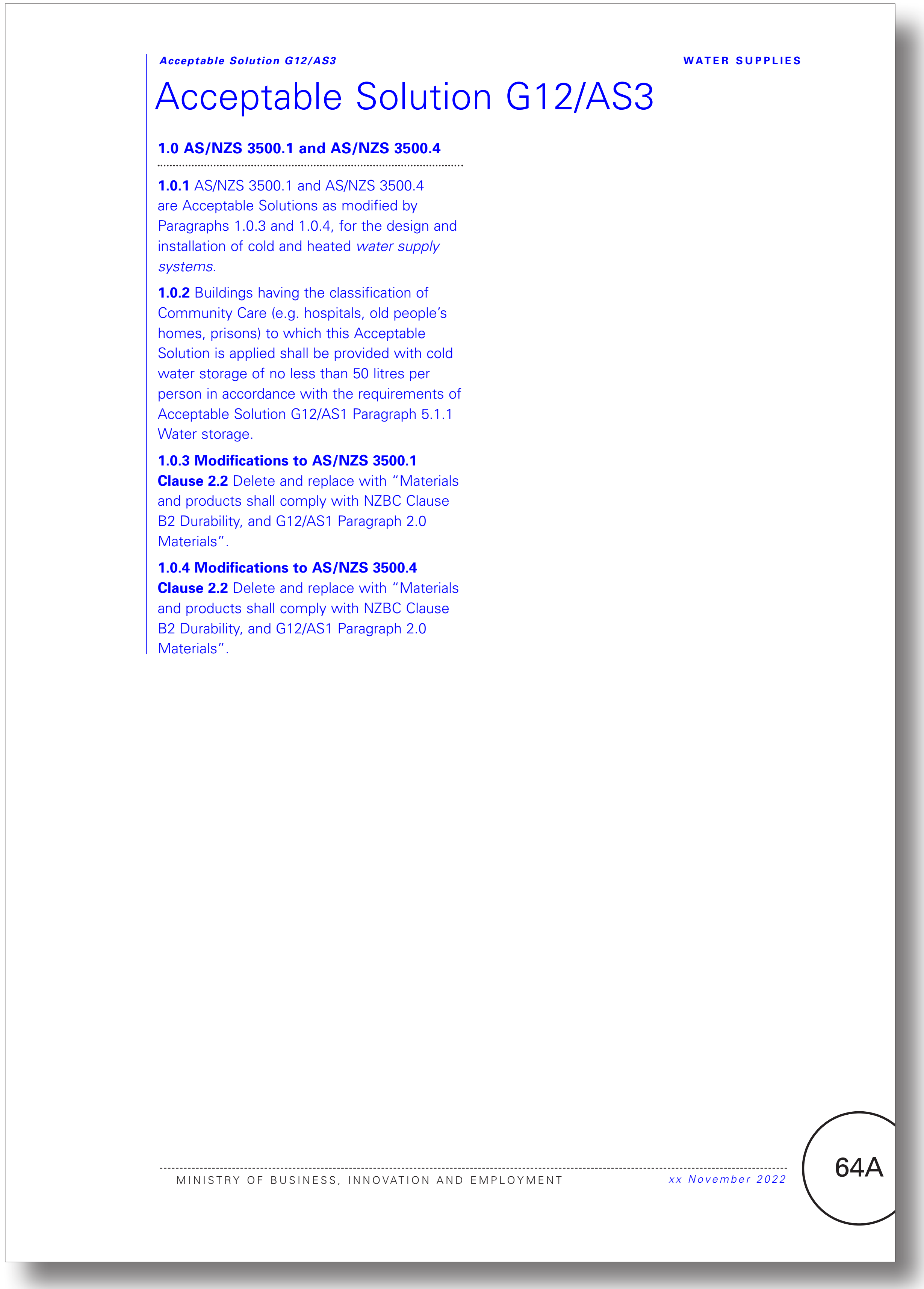
Current G12 Water Supplies acceptable solutions and verification methods (Text to be amended shown in red)

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



Acceptable Solution G12/AS3 WATER SUPPLIES

Acceptable Solution G12/AS3

1.0 AS/NZS 3500.1 and AS/NZS 3500.4

1.0.1 AS/NZS 3500.1 and AS/NZS 3500.4 are Acceptable Solutions as modified by Paragraphs 1.0.3 and 1.0.4, for the design and installation of cold and heated *water supply systems*.

1.0.2 Buildings having the classification of Community Care (e.g. hospitals, old people's homes, prisons) to which this Acceptable Solution is applied shall be provided with cold water storage of no less than 50 litres per person in accordance with the requirements of Acceptable Solution G12/AS1 Paragraph 5.1.1 Water storage.

1.0.3 Modifications to AS/NZS 3500.1
Clause 2.2 Delete and replace with "Materials and products shall comply with NZBC Clause B2 Durability, and G12/AS1 Paragraph 2.0 Materials".

1.0.4 Modifications to AS/NZS 3500.4
Clause 2.2 Delete and replace with "Materials and products shall comply with NZBC Clause B2 Durability, and G12/AS1 Paragraph 2.0 Materials".

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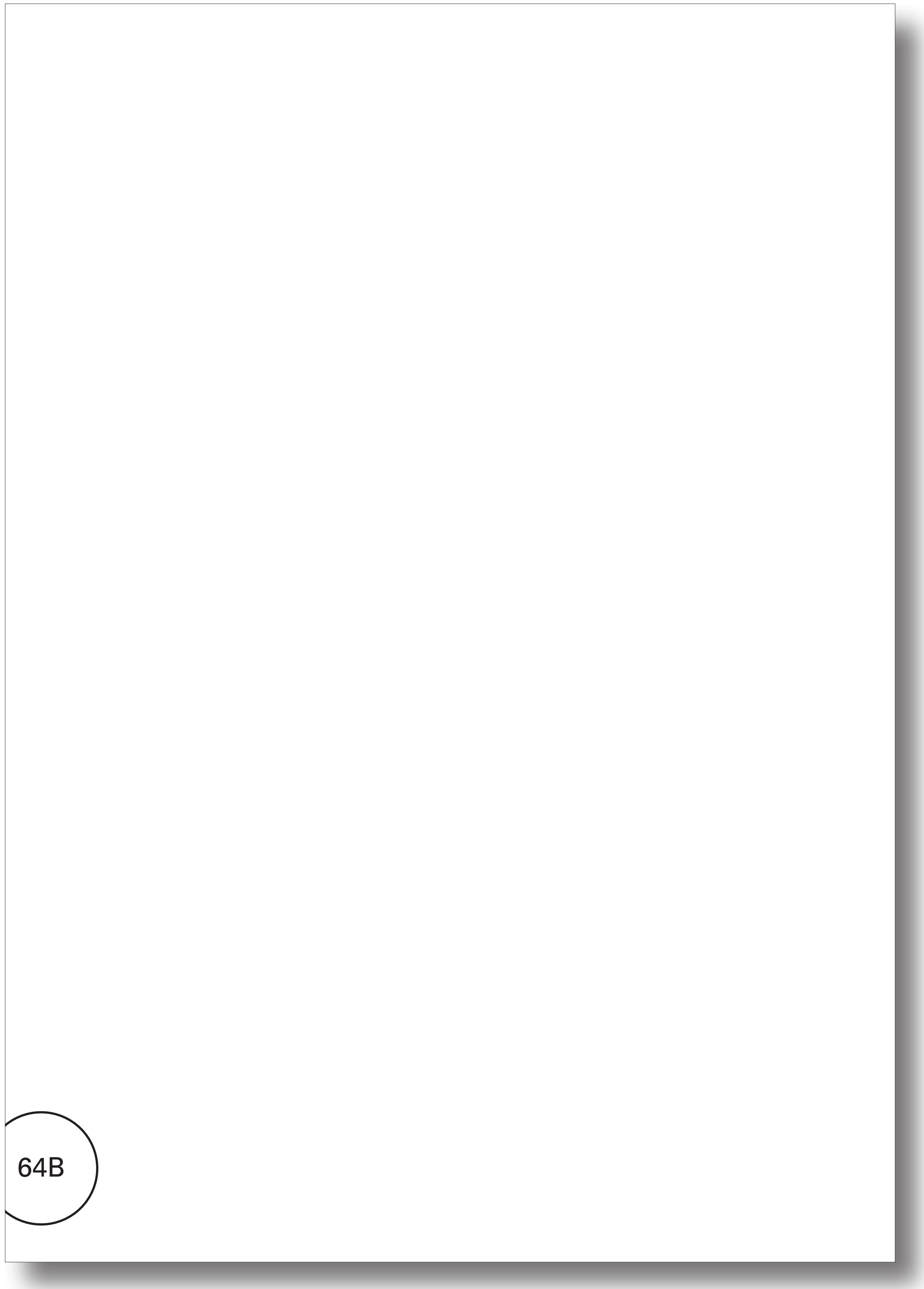
Current G12 Water Supplies acceptable solutions and verification methods (Text to be amended shown in red)

Proposed amendments to G12 Water Supplies acceptable solutions and verification methods (Proposed text in blue)



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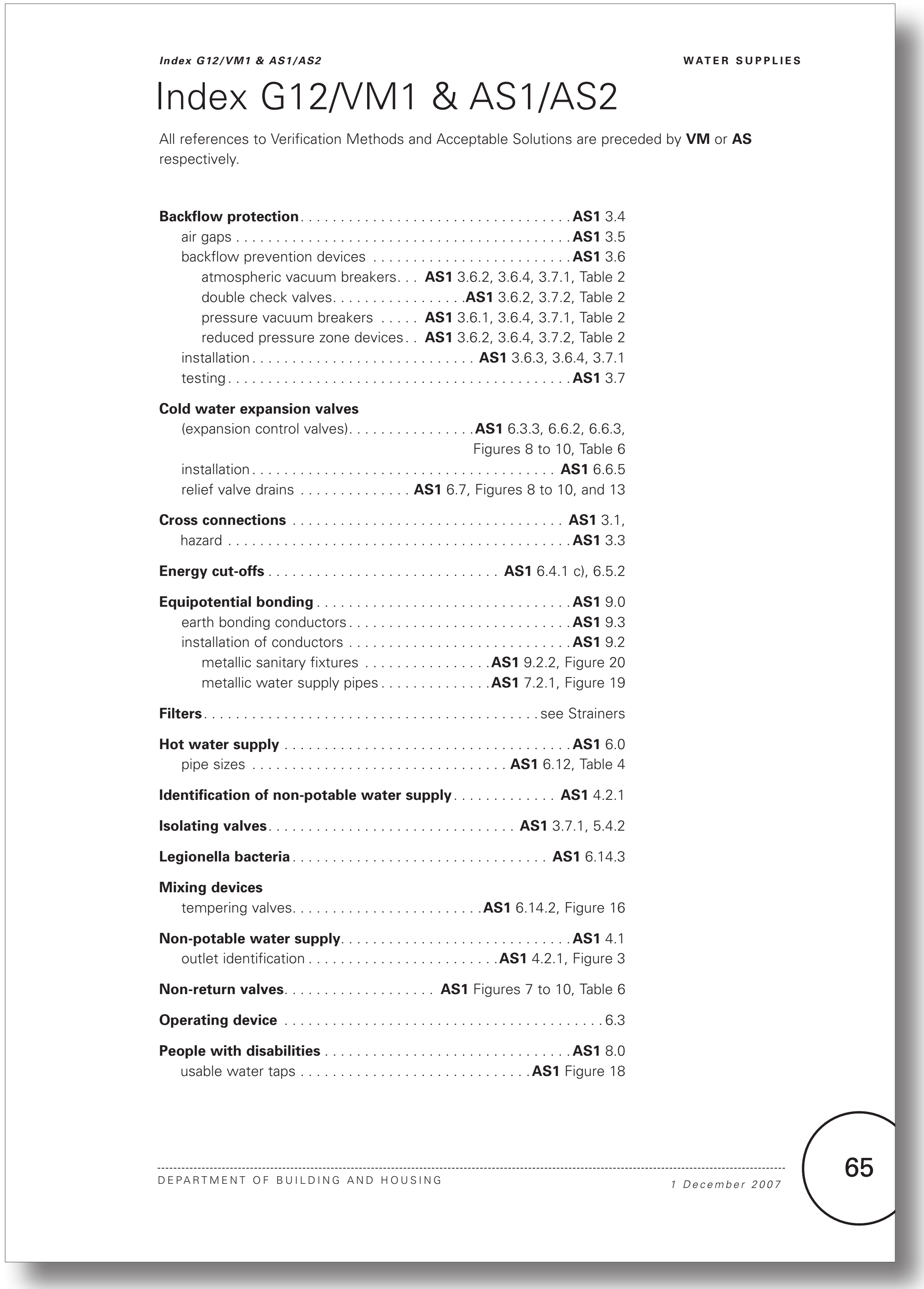
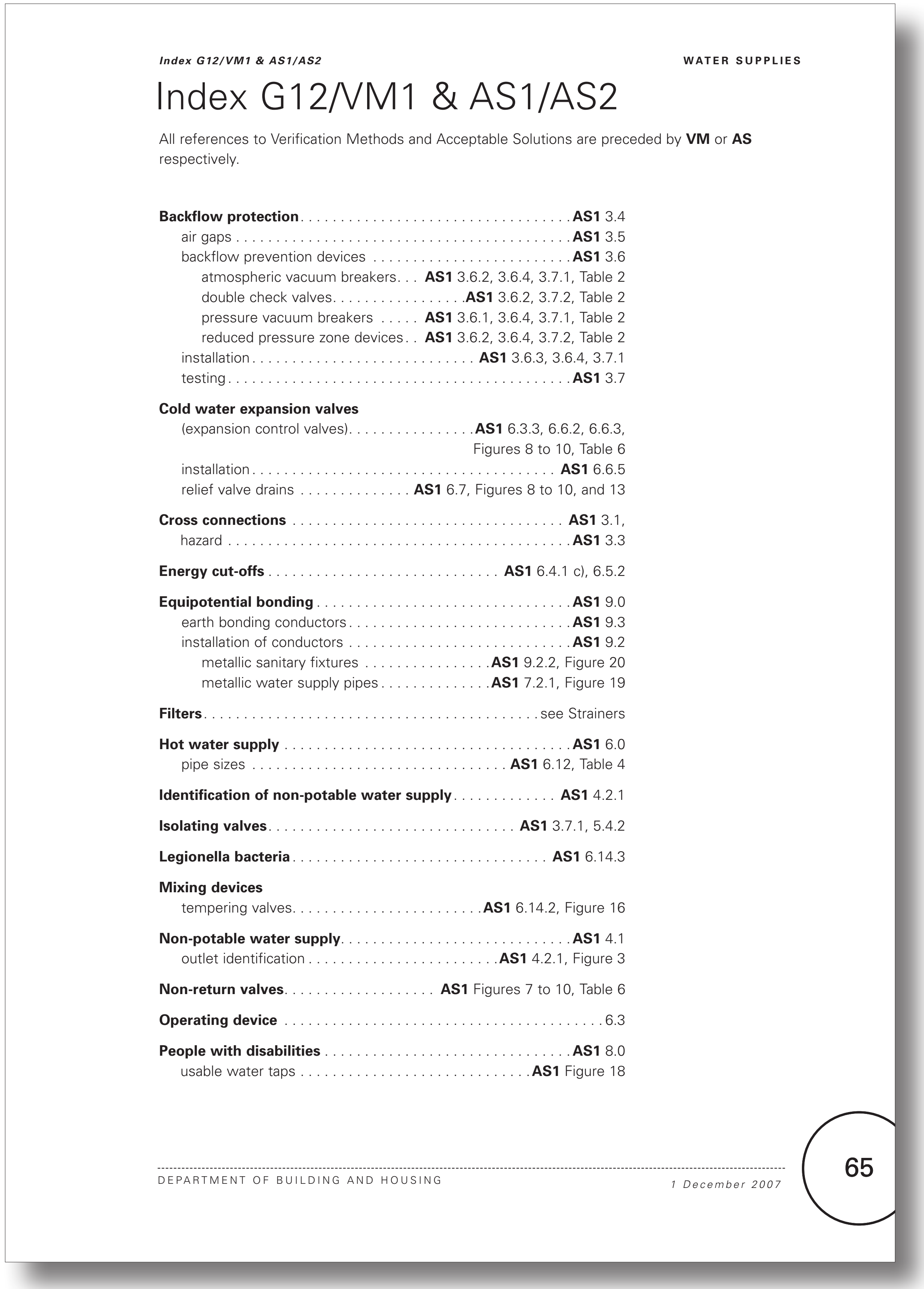
Current G12 Water Supplies - No changes proposed to this page



Index G12/VM1 & AS1/AS2

All references to Verification Methods and Acceptable Solutions are preceded by **VM** or **AS** respectively.

Proposed G12 Water Supplies - No changes proposed to this page



Index G12/VM1 & AS1/AS2 WATER SUPPLIES

Index G12/VM1 & AS1/AS2

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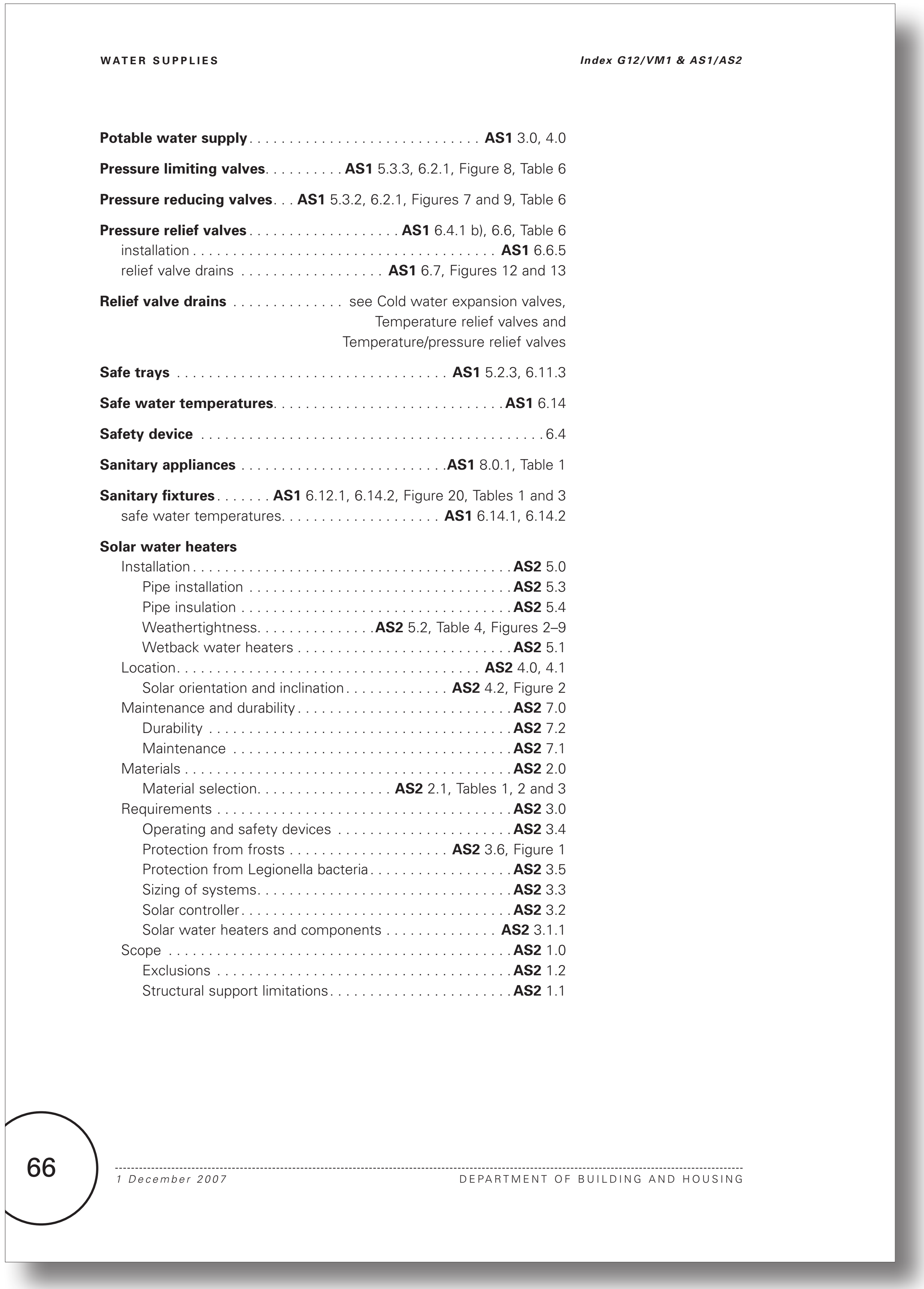

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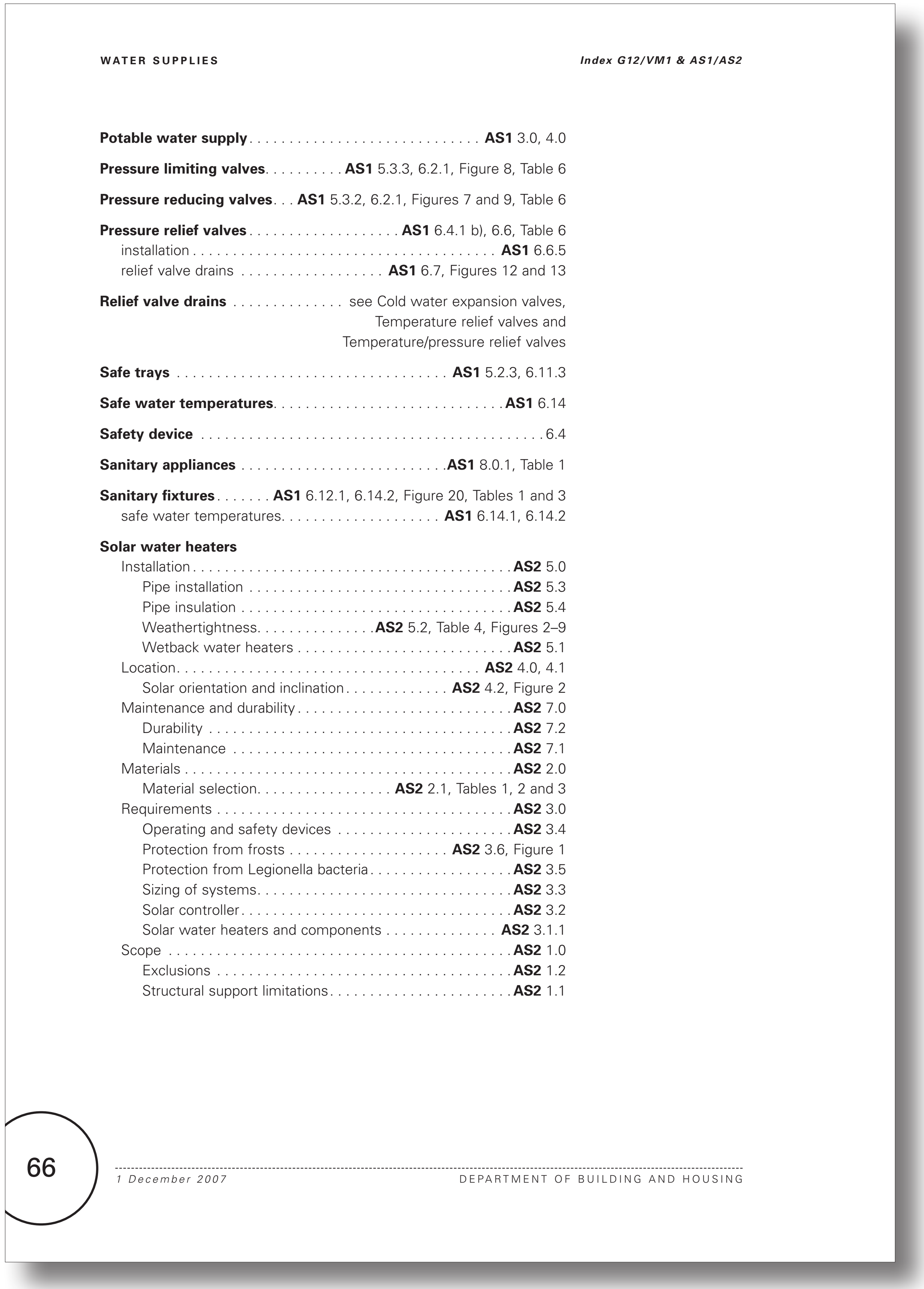

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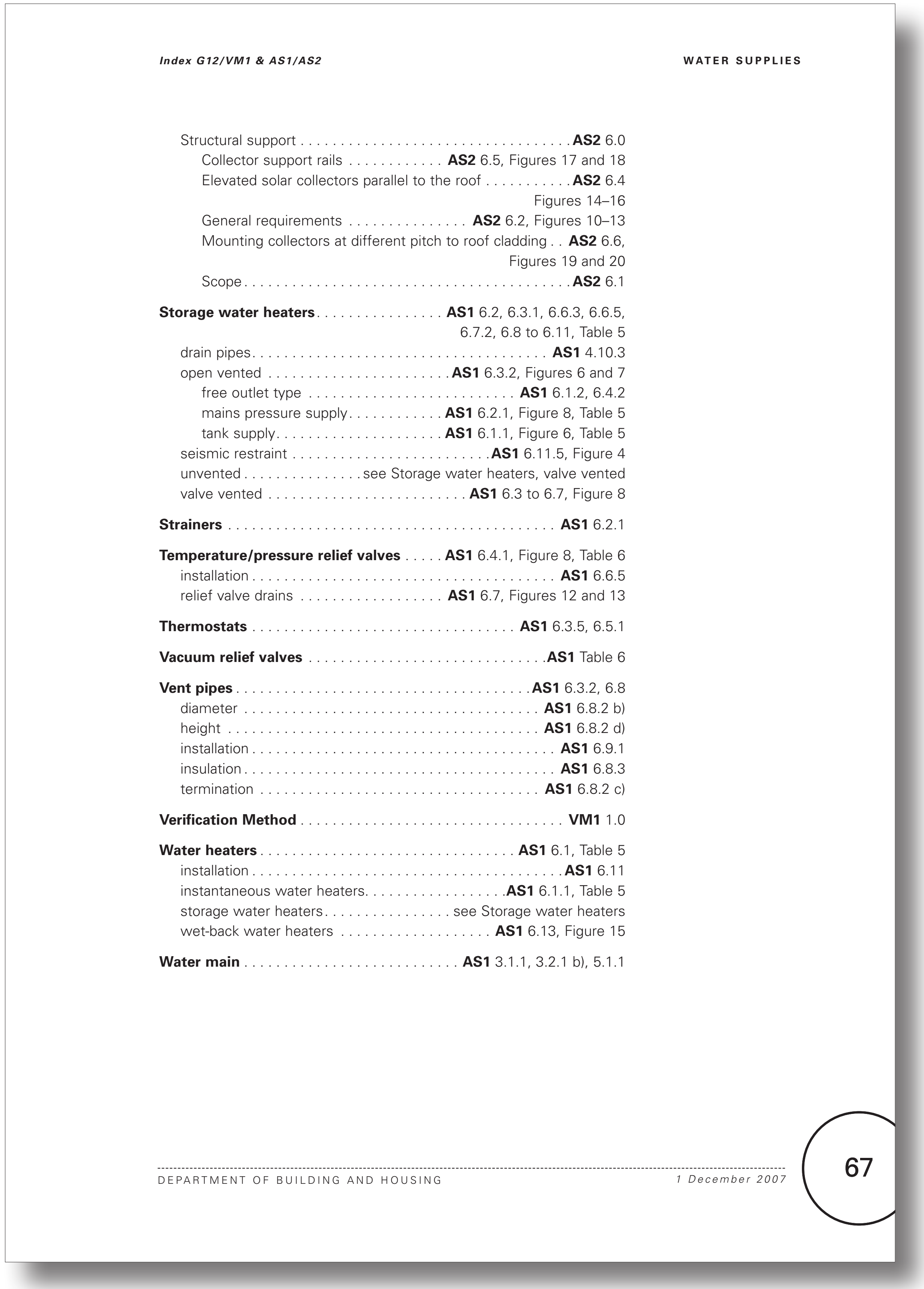

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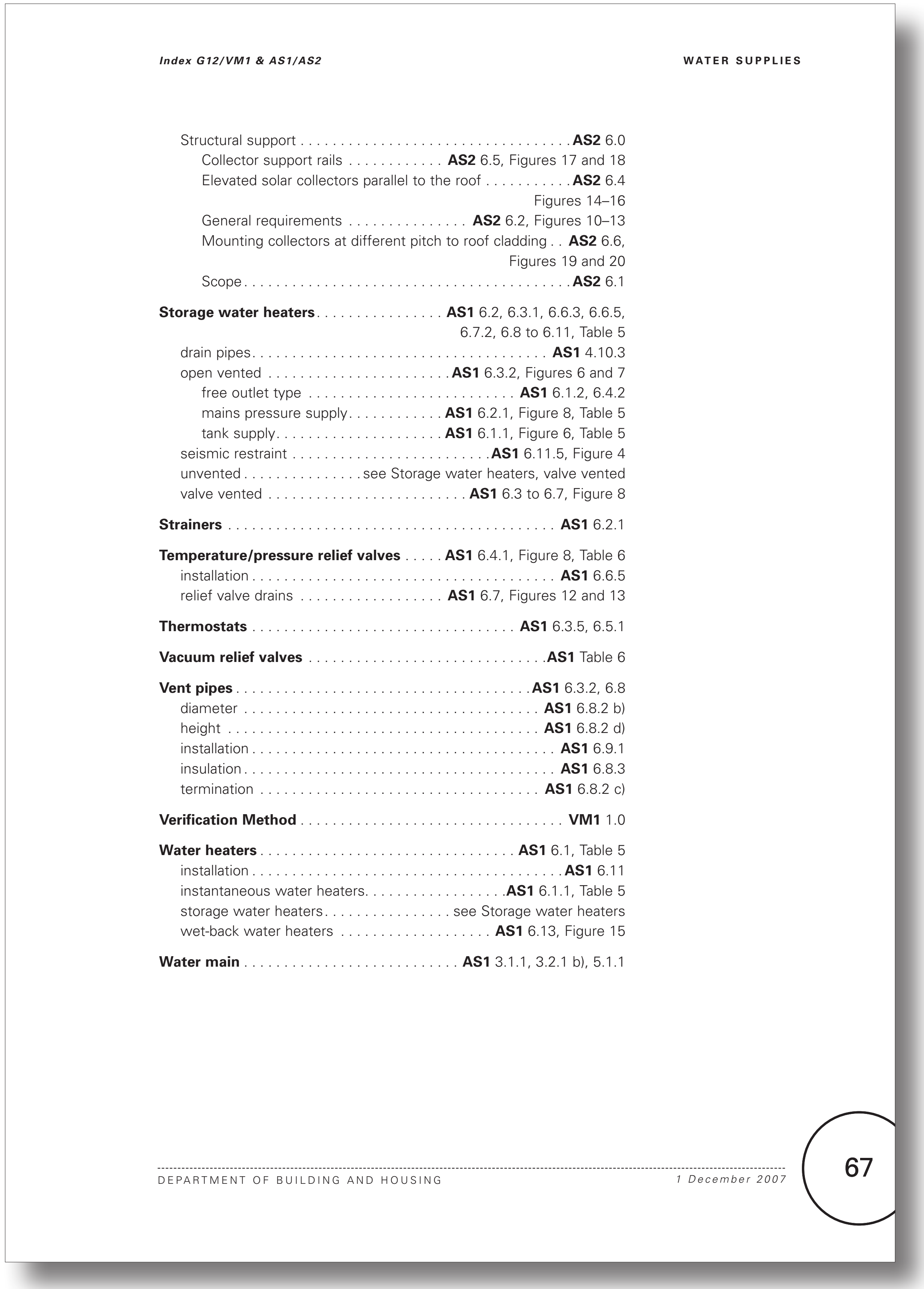

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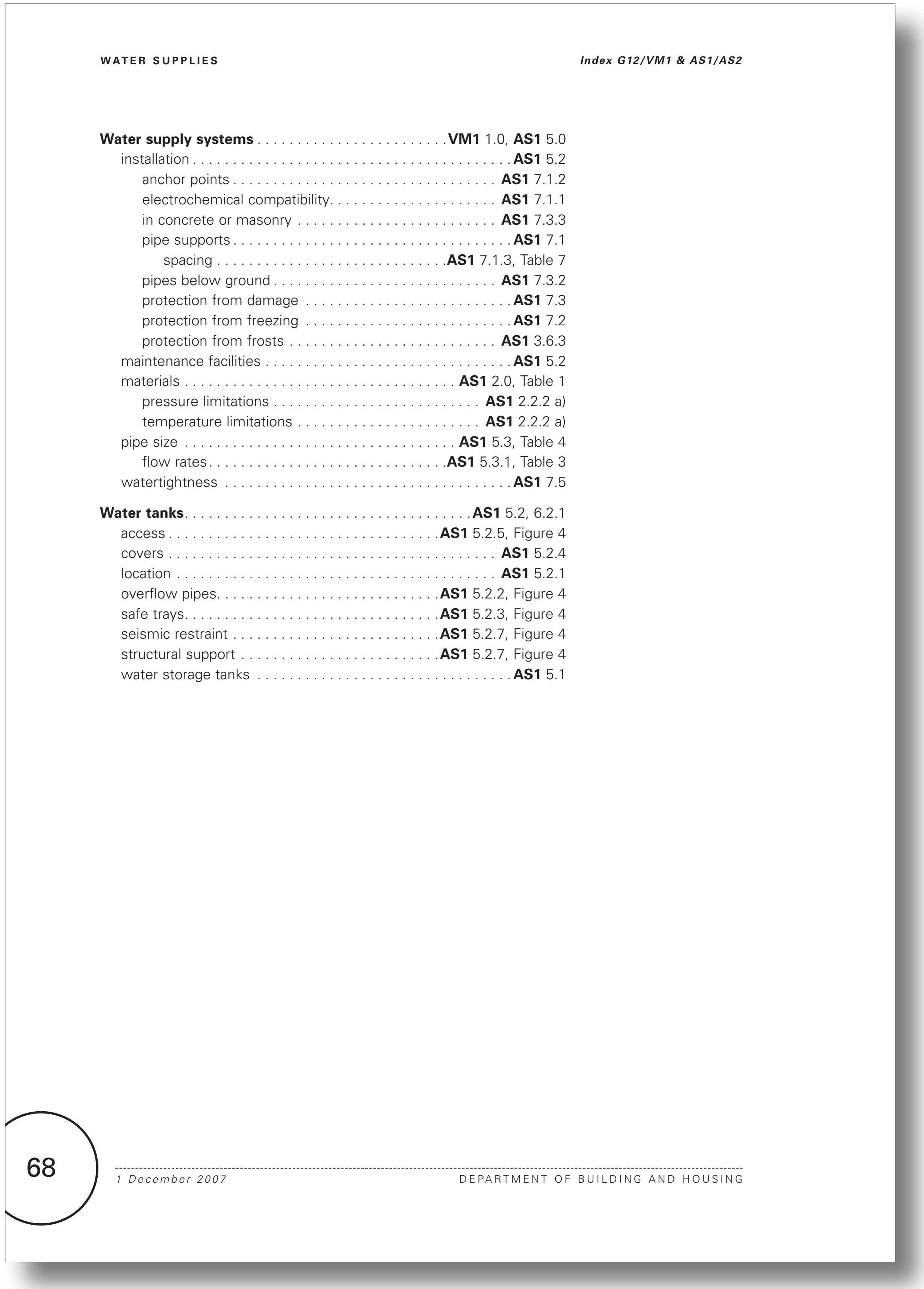

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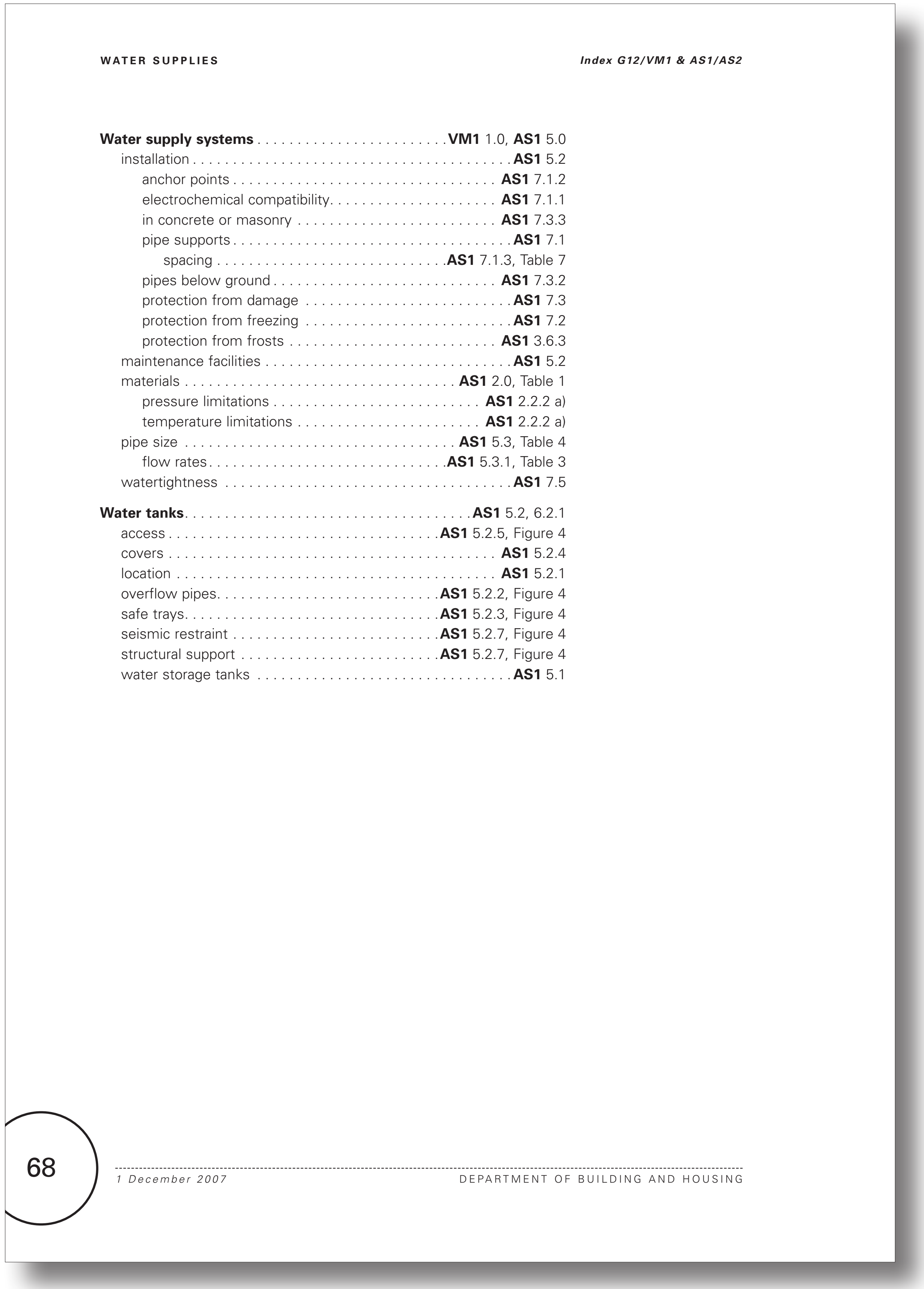

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  - anchor points **AS1** 7.1.2
  - electrochemical compatibility **AS1** 7.1.1
  - in concrete or masonry **AS1** 7.3.3
  - pipe supports **AS1** 7.1
    - spacing . . . . **AS1** 7.1.3, Table 7
  - pipes below ground **AS1** 7.3.2
  - protection from damage **AS1** 7.3
  - protection from freezing **AS1** 7.2
  - protection from frosts **AS1** 3.6.3
- maintenance facilities **AS1** 5.2
- materials . . . . **AS1** 2.0, Table 1
  - pressure limitations . . . . **AS1** 2.2.2 a)
  - temperature limitations . . . . **AS1** 2.2.2 a)
- pipe size . . . . **AS1** 5.3, Table 4
  - flow rates . . . . **AS1** 5.3.1, Table 3
- watertightness **AS1** 7.5

Water tanks **AS1** 5.2, 6.2.1
- access . . . . **AS1** 5.2.5, Figure 4
- covers **AS1** 5.2.4
- location **AS1** 5.2.1
- overflow pipes . . . . **AS1** 5.2.2, Figure 4
- safe trays . . . . **AS1** 5.2.3, Figure 4
- seismic restraint . . . . **AS1** 5.2.7, Figure 4
- structural support . . . . **AS1** 5.2.7, Figure 4
- water storage tanks **AS1** 5.1

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Appendix C. Proposed changes to the acceptable solutions and verification methods for clause G13 Foul Water

As part of Proposals 4, 6, and 7, here are proposed changes to the acceptable solutions and verification methods for clause G13 Foul Water. The list below identifies the portions of the documents that are proposed to be amended as part of each proposal. The proposed changes are also presented as part of the full document with the new or amended text shown in blue.

Proposal 4. AS/NZS 3500 Plumbing and drainage standards

- **Acceptable Solution G13/AS3**
  - Cite the new AS/NZS 3500.2: 2021 Plumbing and drainage – Sanitary plumbing and drainage Amendment 1
  - Remove the modifications to AS/NZS 3500.2 previously found in G13/AS3 for Clauses 4.9.1, 5.6, 6.6.2.4, and 6.6.2.6. These modifications are no longer necessary for the proposed citation of AS/NZS 3500.2: 2021
  - Update the modification to AS/NZS 3500.2 Clause 2.2 to reference the G13/AS2 provisions for foul water drainage systems materials and products

Proposal 6. Plumbing and drainage system material standards

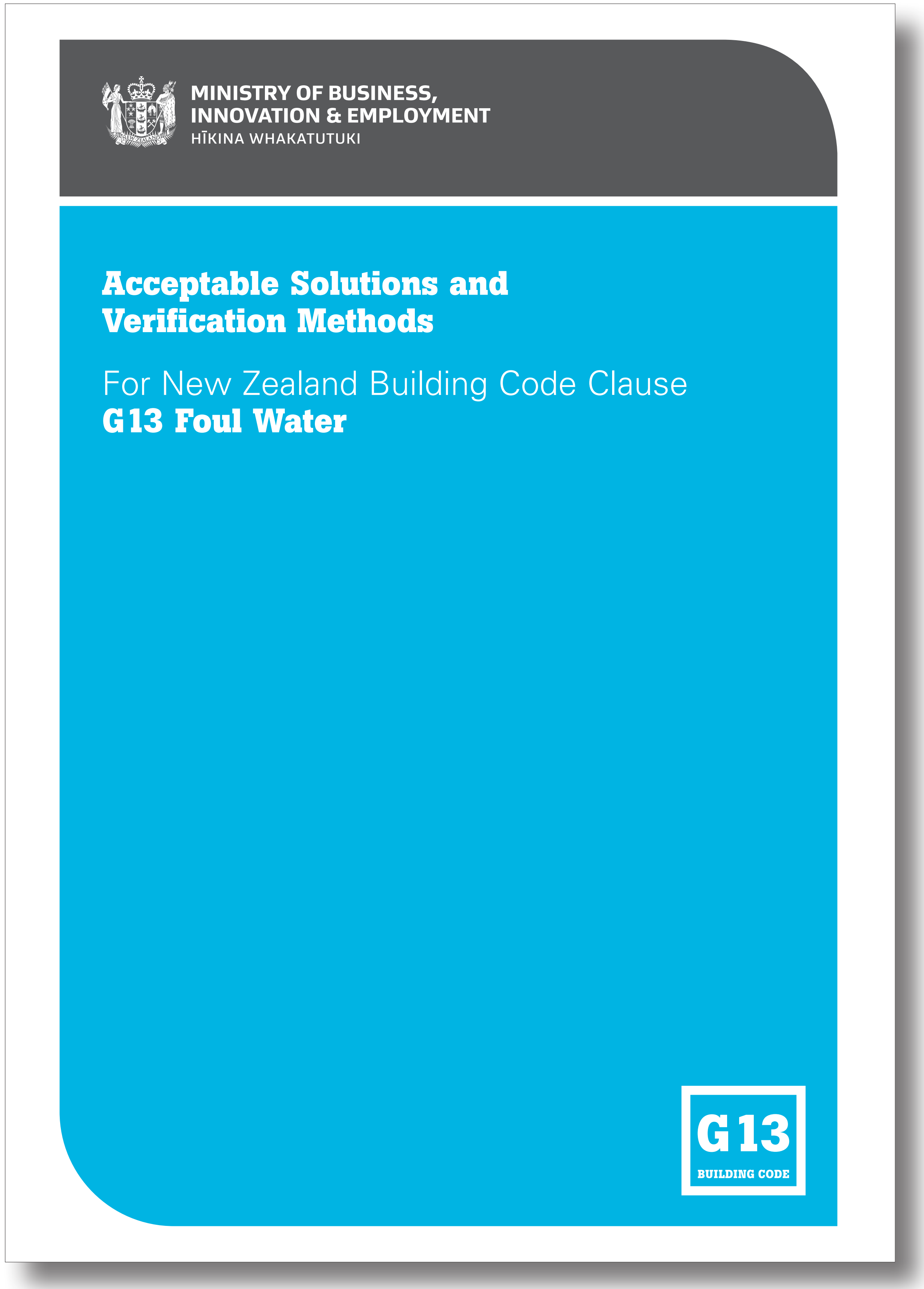
- **Cite new plumbing and drainage system material standards in Acceptable Solutions G13/AS1 & G13/AS2**
  - AS/NZS 2280: 2020 Ductile iron pipes and fittings Amendment 1
  - AS/NZS 3879: 2011 Solvent cements and priming fluids for PVC (PVC-U and PVC-M) and ABS and ASA pipes and fittings
  - AS/NZS 4130: 2018 Polyethylene (PE) pipe for pressure applications Amendment 1
  - AS/NZS 7671: 2010 Plastics piping systems for soil and waste discharge (low and high temperature) inside buildings - Polypropylene (PP)
  - AS 1432: 2004 Copper tubes for plumbing, gasfitting and drainage applications
  - AS 1741: 1991 Vitrified clay pipes and fittings with flexible joints - Sewer quality
  - AS 3571: 2009 Plastic piping systems – Glass reinforced thermoplastics (GRP) systems based on unsaturated polyester (UP) resin – pressure and non-pressure drainage and sewerage (ISO 10467: 2004 MOD) Amendment 1
  - AS 4809: 2017 Copper pipe and fittings – Installation and commissioning
  - BS EN 295.1: 2013 Vitrified clay pipe systems for drains and sewers – Requirements for pipes, fittings and joints
  - BS EN 1124: Pipes and fittings of longitudinally welded stainless steel pipes with spigot and socket for waste water systems
    Part 1: 1999 Requirements, testing, quality control
    Part 2: 2014 System S, forms and dimensions
- **Other changes as part of this proposal**
  - G13/AS1 Paragraph 2.1.2 and G13/AS2 Paragraph 2.0.2 – Provide informative comments to explain that WaterMarked products may be deemed to satisfy the relevant performances of clause G13
  - G13/AS1 Table 1 and G13/AS2 Table 1 – Amend the list of materials for sanitary plumbing and drainage pipes to include additional materials and cite installation and manufacturing standards

Appendix C. Proposed changes to the acceptable solutions and verification methods for clause G13 Foul Water

Proposal 7. Resolving conflicts and editorial changes

- G13/AS1 Paragraph 4.6.3 and G13/AS2 Paragraph 3.5.2 and Figure 1 – Provide new requirements for the installation of junctions in graded pipes and drains to align with AS/NZS 3500.2: 2021
- G13/AS2 Paragraph 3.3.1 (ii) and Figure 2 – Change the gully trap height above unpaved ground level from 100 mm to 75 mm for consistency with equivalent requirements under G13/AS3 (AS/NZS 3500.2: 2021)
- G13/AS2 Paragraph 3.5.2 – Provide a new comment to help clarify the requirement for drains to be installed at the maximum practicable gradie

Current G13 Foul Water - No changes proposed to this page



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Acceptable Solutions and Verification Methods

For New Zealand Building Code Clause
G13 Foul Water

G13
BUILDING CODE

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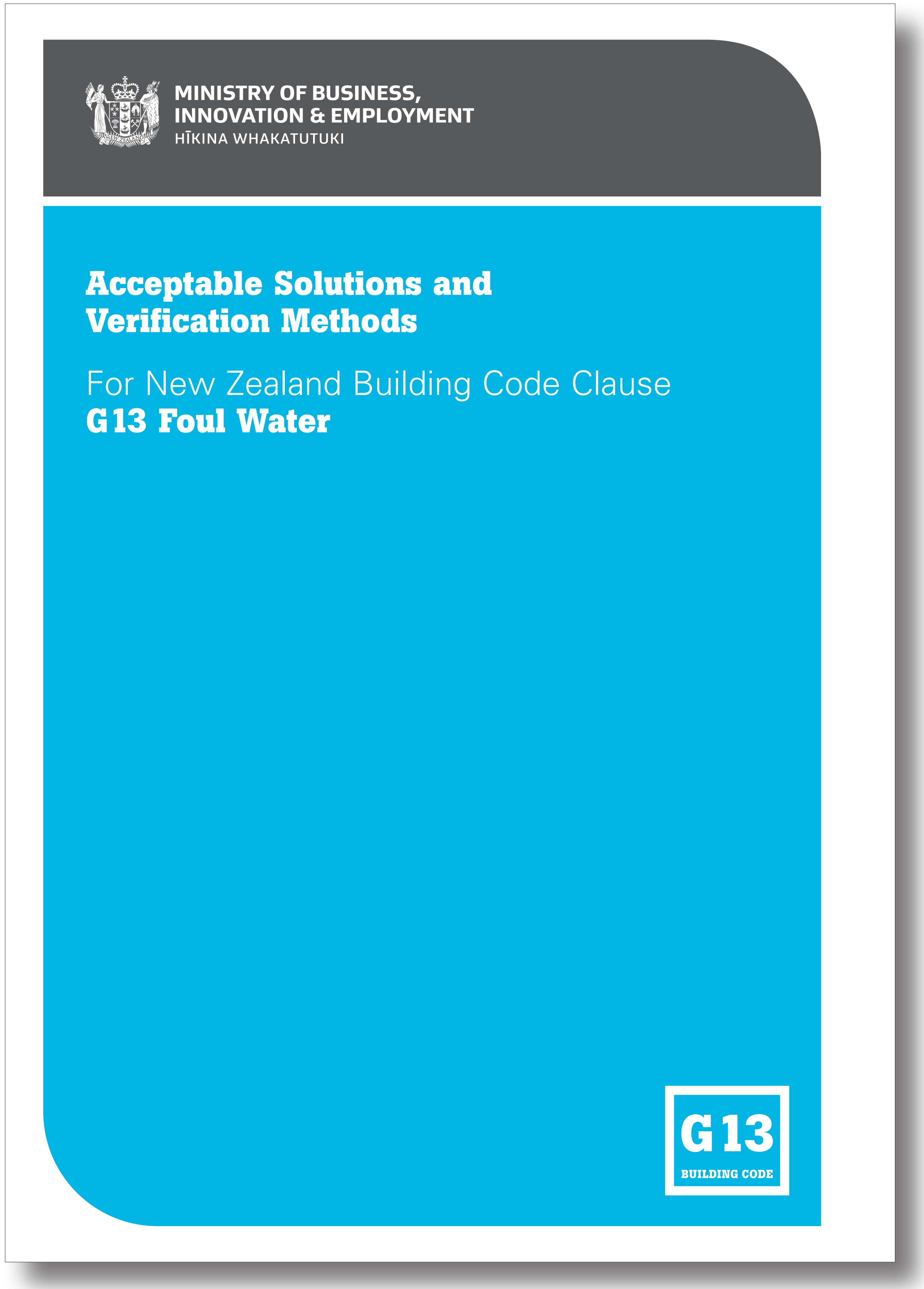

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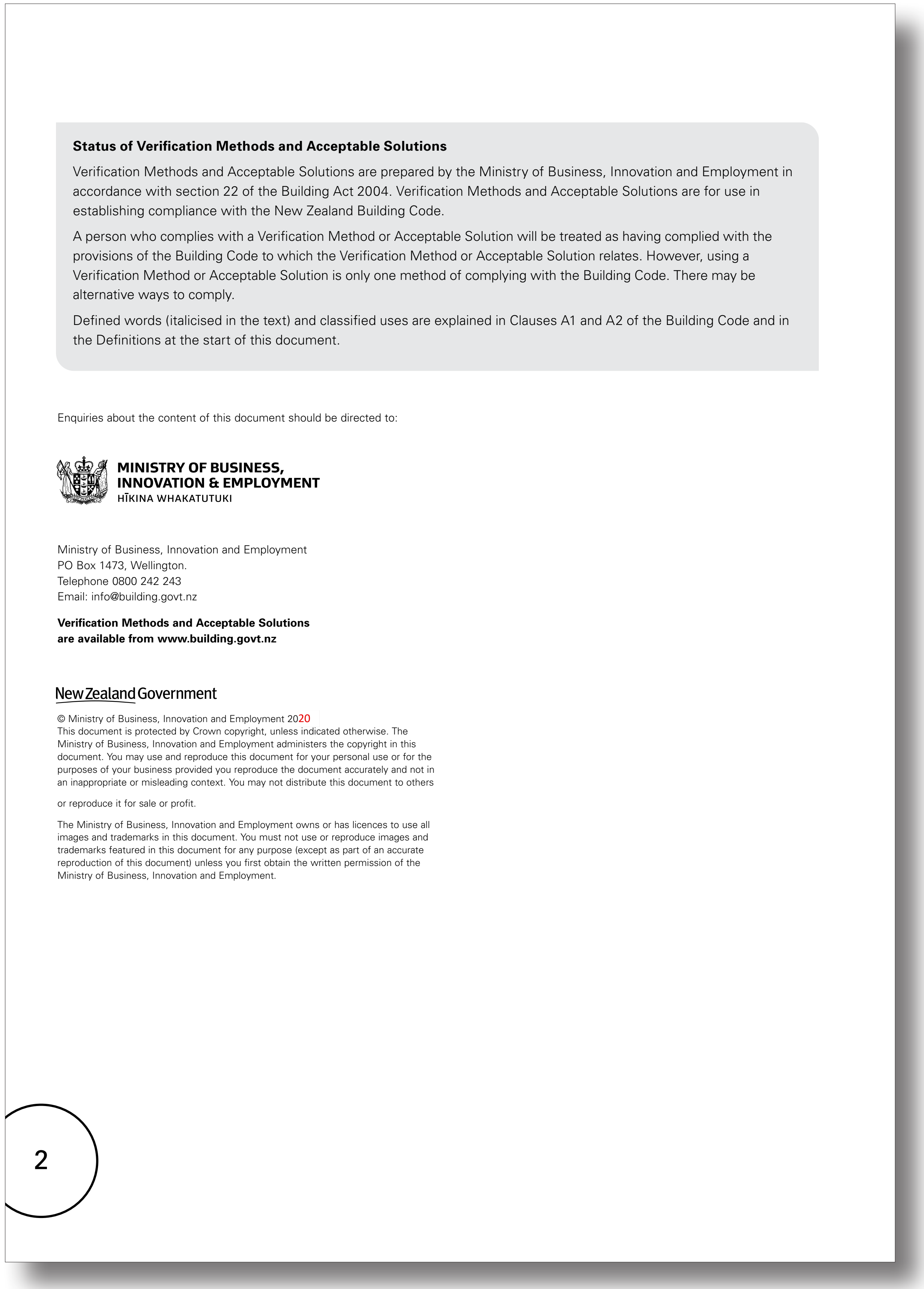
Acceptable Solutions and Verification Methods

For New Zealand Building Code Clause
G13 Foul Water

G13
BUILDING CODE

Current G13 Foul Water acceptable solutions and verification methods (Text to be amended shown in red)



Status of Verification Methods and Acceptable Solutions

Verification Methods and Acceptable Solutions are prepared by the Ministry of Business, Innovation and Employment in accordance with section 22 of the Building Act 2004. Verification Methods and Acceptable Solutions are for use in establishing compliance with the New Zealand Building Code.

A person who complies with a Verification Method or Acceptable Solution will be treated as having complied with the provisions of the Building Code to which the Verification Method or Acceptable Solution relates. However, using a Verification Method or Acceptable Solution is only one method of complying with the Building Code. There may be alternative ways to comply.

Defined words (italicised in the text) and classified uses are explained in Clauses A1 and A2 of the Building Code and in the Definitions at the start of this document.

Enquiries about the content of this document should be directed to:

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Ministry of Business, Innovation and Employment
PO Box 1473, Wellington.
Telephone 0800 242 243
Email: info@building.govt.nz

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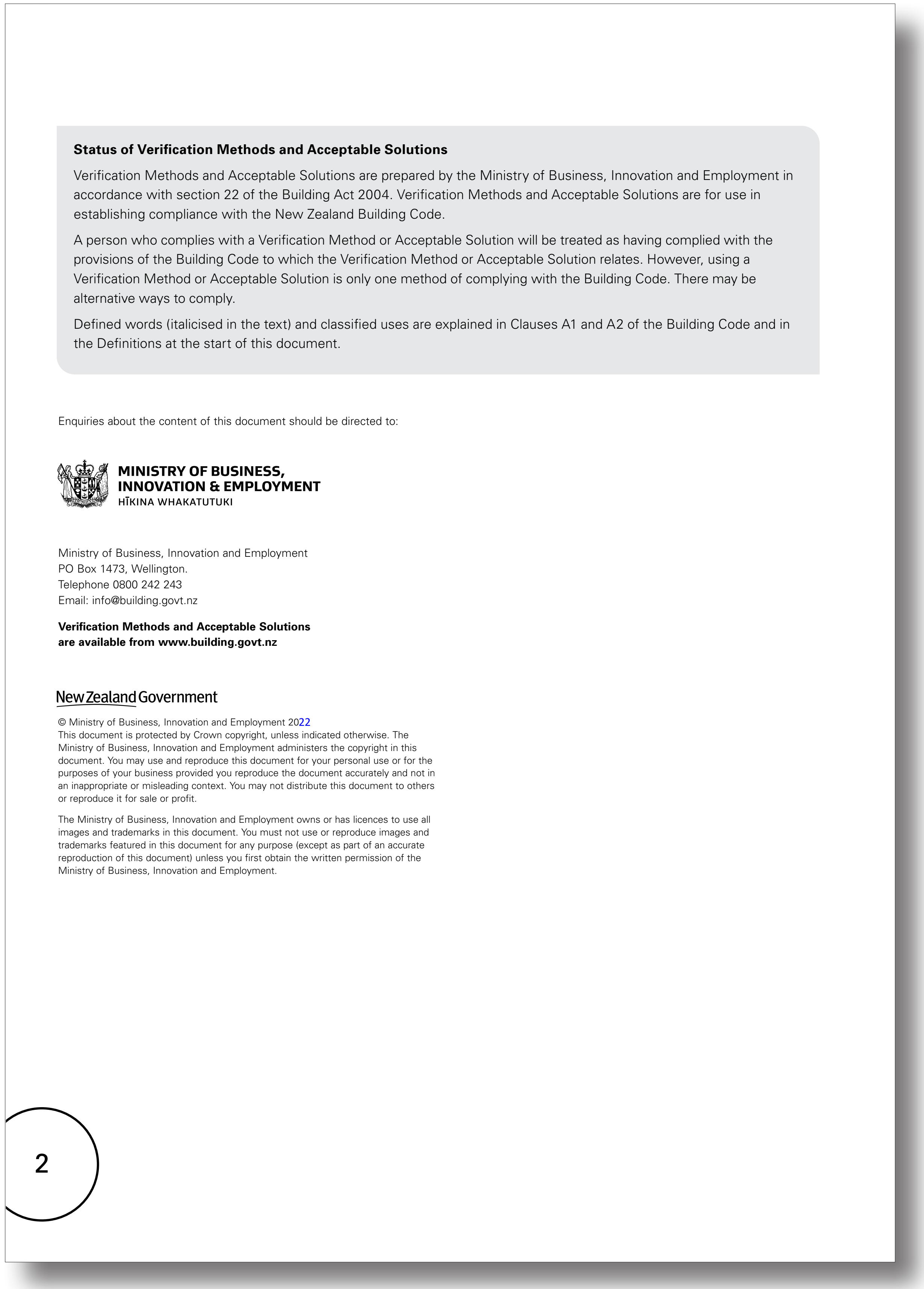
Proposed amendments to G13 Foul Water acceptable solutions and verification methods (Proposed text in blue)



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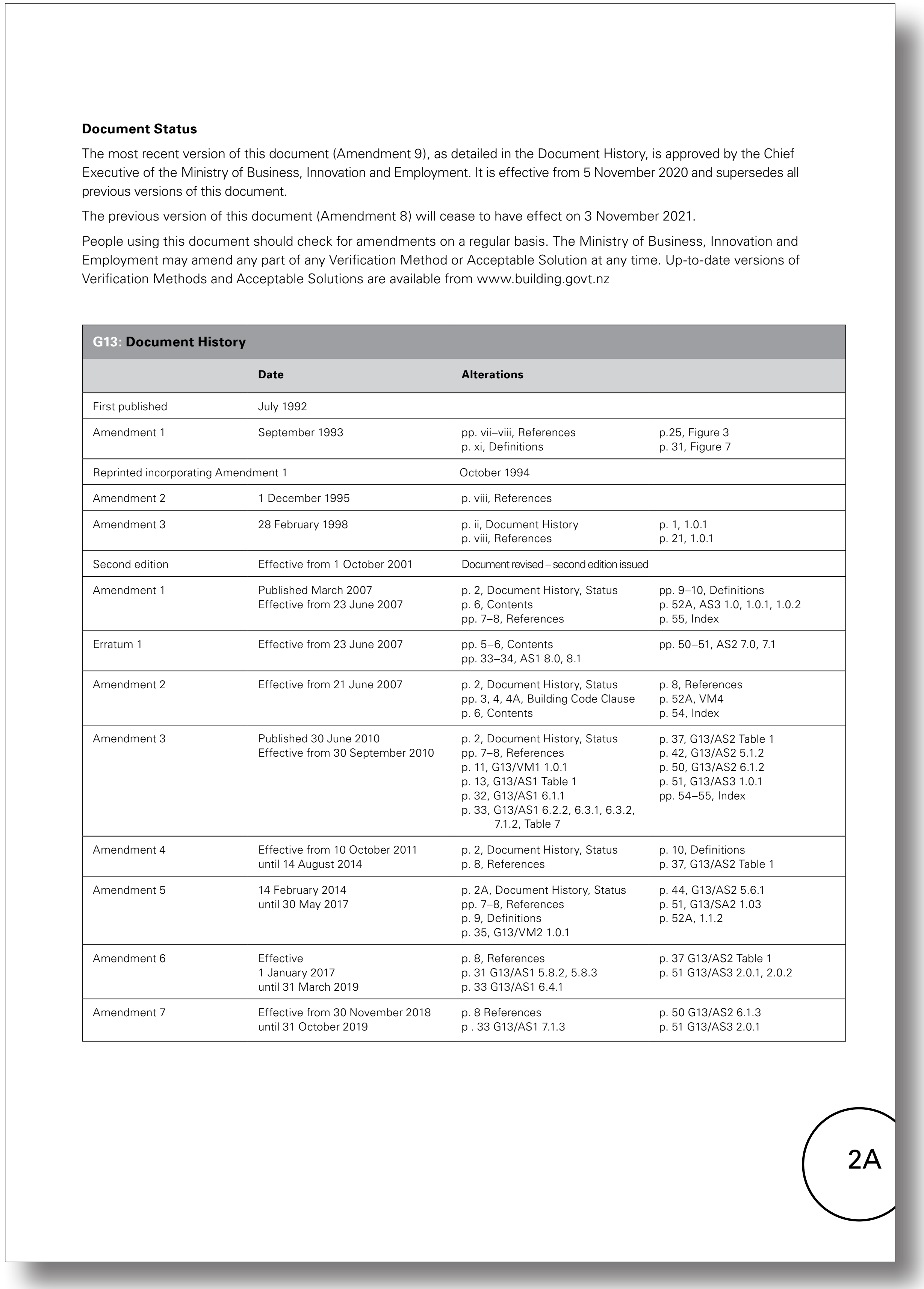


Document Status

The most recent version of this document (Amendment 9), as detailed in the Document History, is approved by the Chief Executive of the Ministry of Business, Innovation and Employment. It is effective from 5 November 2020 and supersedes all previous versions of this document.

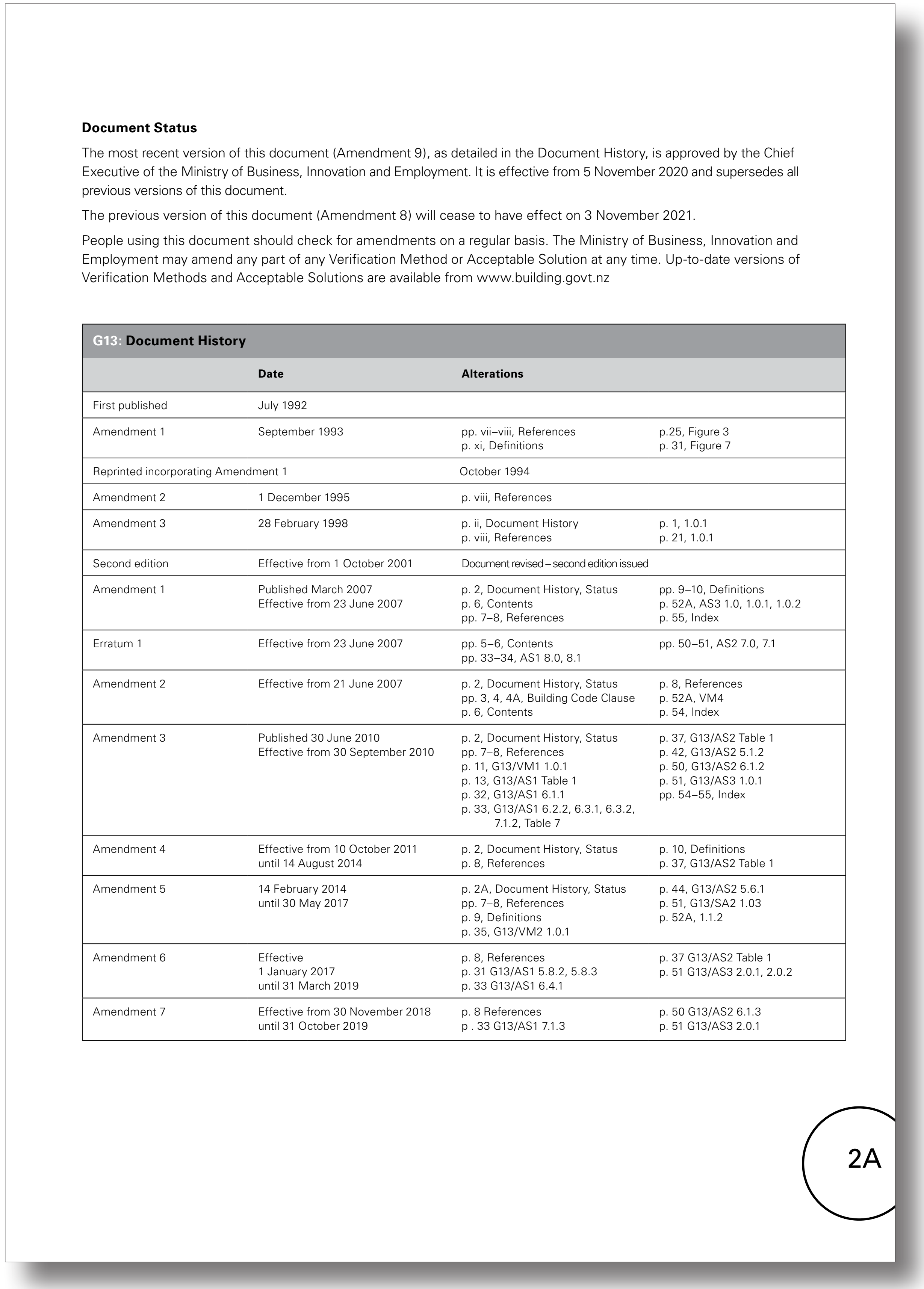
The previous version of this document (Amendment 8) will cease to have effect on 3 November 2021.

People using this document should check for amendments on a regular basis. The Ministry of Business, Innovation and Employment may amend any part of any Verification Method or Acceptable Solution at any time. Up-to-date versions of Verification Methods and Acceptable Solutions are available from www.building.govt.nz

G13: Document History

	Date	Alterations	
First published	July 1992		
Amendment 1	September 1993	pp. vii–viii, References p. xi, Definitions	p.25, Figure 3 p. 31, Figure 7
Reprinted incorporating Amendment 1		October 1994	
Amendment 2	1 December 1995	p. viii, References	
Amendment 3	28 February 1998	p. ii, Document History p. viii, References	p. 1, 1.0.1 p. 21, 1.0.1
Second edition	Effective from 1 October 2001	Document revised – second edition issued	
Amendment 1	Published March 2007 Effective from 23 June 2007	p. 2, Document History, Status p. 6, Contents pp. 7–8, References	pp. 9–10, Definitions p. 52A, AS3 1.0, 1.0.1, 1.0.2 p. 55, Index
Erratum 1	Effective from 23 June 2007	pp. 5–6, Contents pp. 33–34, AS1 8.0, 8.1	pp. 50–51, AS2 7.0, 7.1
Amendment 2	Effective from 21 June 2007	p. 2, Document History, Status pp. 3, 4, 4A, Building Code Clause p. 6, Contents	p. 8, References p. 52A, VM4 p. 54, Index
Amendment 3	Published 30 June 2010 Effective from 30 September 2010	p. 2, Document History, Status pp. 7–8, References p. 11, G13/VM1 1.0.1 p. 13, G13/AS1 Table 1 p. 32, G13/AS1 6.1.1 p. 33, G13/AS1 6.2.2, 6.3.1, 6.3.2, 7.1.2, Table 7	p. 37, G13/AS2 Table 1 p. 42, G13/AS2 5.1.2 p. 50, G13/AS2 6.1.2 p. 51, G13/AS3 1.0.1 pp. 54–55, Index
Amendment 4	Effective from 10 October 2011 until 14 August 2014	p. 2, Document History, Status p. 8, References	p. 10, Definitions p. 37, G13/AS2 Table 1
Amendment 5	14 February 2014 until 30 May 2017	p. 2A, Document History, Status pp. 7–8, References p. 9, Definitions p. 35, G13/VM2 1.0.1	p. 44, G13/AS2 5.6.1 p. 51, G13/SA2 1.03 p. 52A, 1.1.2
Amendment 6	Effective 1 January 2017 until 31 March 2019	p. 8, References p. 31 G13/AS1 5.8.2, 5.8.3 p. 33 G13/AS1 6.4.1	p. 37 G13/AS2 Table 1 p. 51 G13/AS3 2.0.1, 2.0.2
Amendment 7	Effective from 30 November 2018 until 31 October 2019	p. 8 References p . 33 G13/AS1 7.1.3	p. 50 G13/AS2 6.1.3 p. 51 G13/AS3 2.0.1

Proposed G13 Foul Water - No changes proposed to this page



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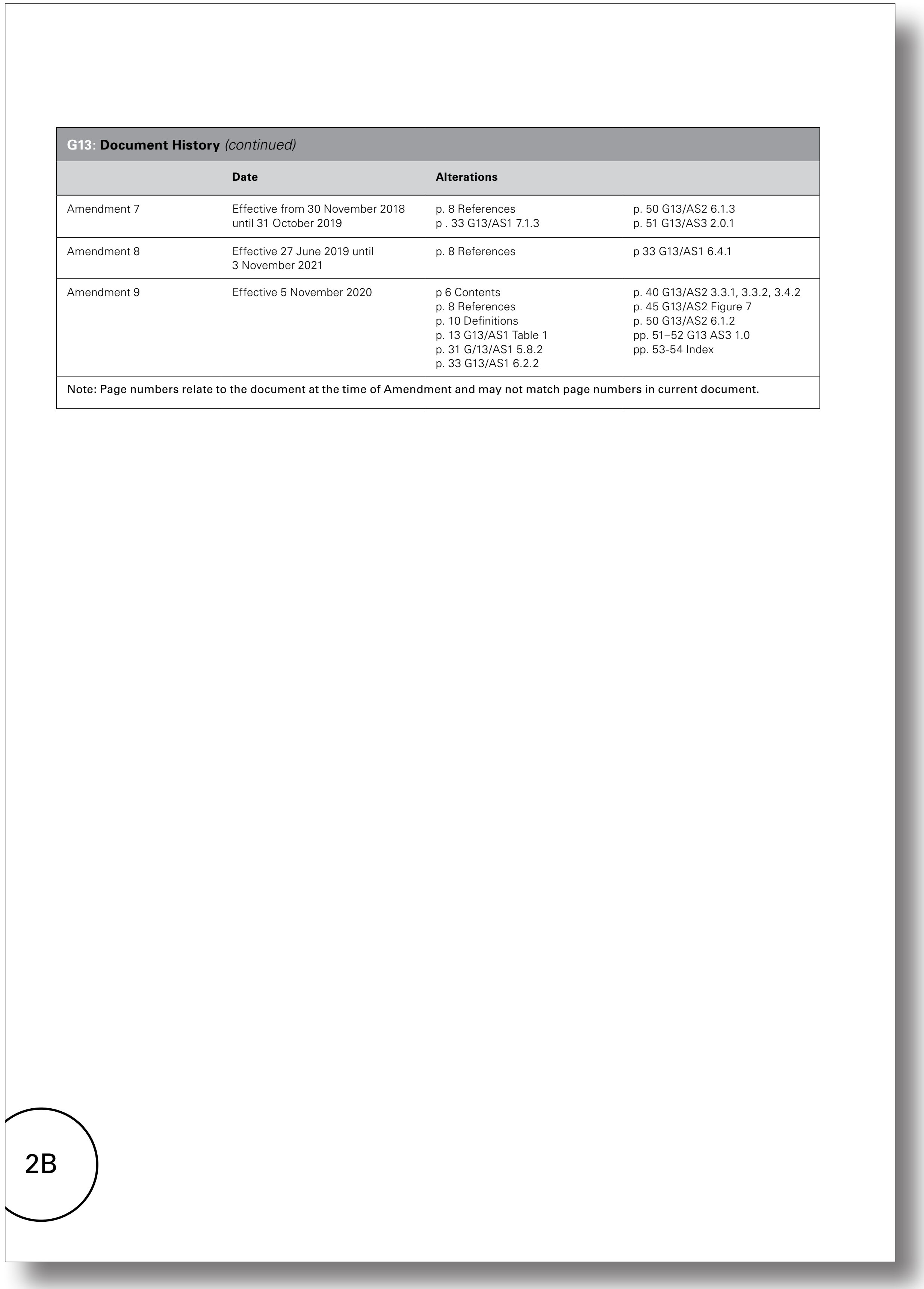
Amendment 6	Effective 1 January 2017 until 31 March 2019	p. 8, References p. 31 G13/AS1 5.8.2, 5.8.3 p. 33 G13/AS1 6.4.1	p. 37 G13/AS2 Table 1 p. 51 G13/AS3 2.0.1, 2.0.2
Amendment 7	Effective from 30 November 2018 until 31 October 2019	p. 8 References p . 33 G13/AS1 7.1.3	p. 50 G13/AS2 6.1.3 p. 51 G13/AS3 2.0.1

2A

Current G13 Foul Water acceptable solutions and verification methods (Text to be amended shown in red)



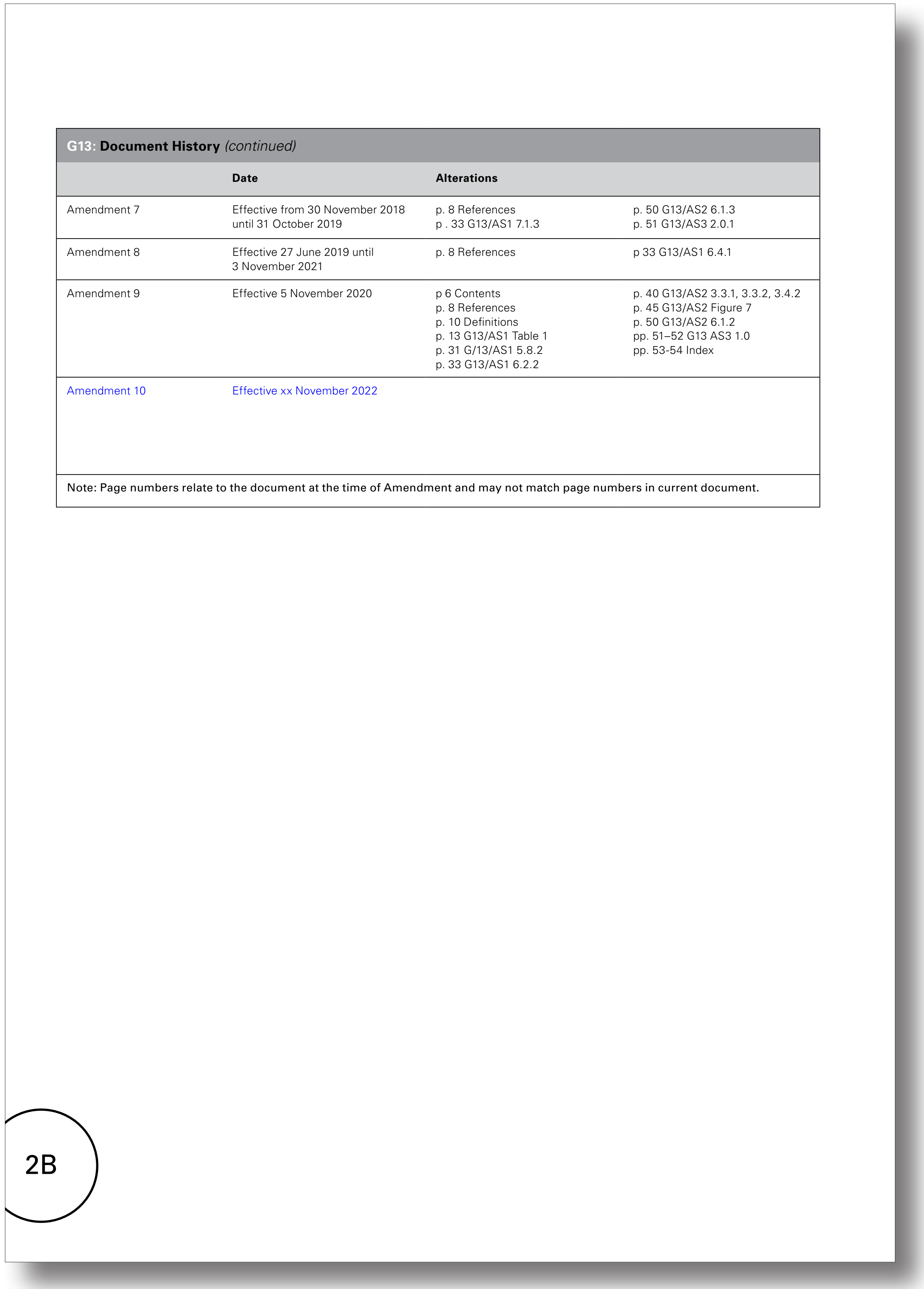
G13: Document History *(continued)*

	Date	Alterations	
Amendment 7	Effective from 30 November 2018 until 31 October 2019	p. 8 References p . 33 G13/AS1 7.1.3	p. 50 G13/AS2 6.1.3 p. 51 G13/AS3 2.0.1
Amendment 8	Effective 27 June 2019 until 3 November 2021	p. 8 References	p 33 G13/AS1 6.4.1
Amendment 9	Effective 5 November 2020	p 6 Contents p. 8 References p. 10 Definitions p. 13 G13/AS1 Table 1 p. 31 G/13/AS1 5.8.2 p. 33 G13/AS1 6.2.2	p. 40 G13/AS2 3.3.1, 3.3.2, 3.4.2 p. 45 G13/AS2 Figure 7 p. 50 G13/AS2 6.1.2 pp. 51–52 G13 AS3 1.0 pp. 53-54 Index

Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.

2B

Proposed amendments to G13 Foul Water acceptable solutions and verification methods (Proposed text in blue)



G13: Document History *(continued)*

	Date	Alterations	
Amendment 7	Effective from 30 November 2018 until 31 October 2019	p. 8 References p . 33 G13/AS1 7.1.3	p. 50 G13/AS2 6.1.3 p. 51 G13/AS3 2.0.1
Amendment 8	Effective 27 June 2019 until 3 November 2021	p. 8 References	p 33 G13/AS1 6.4.1
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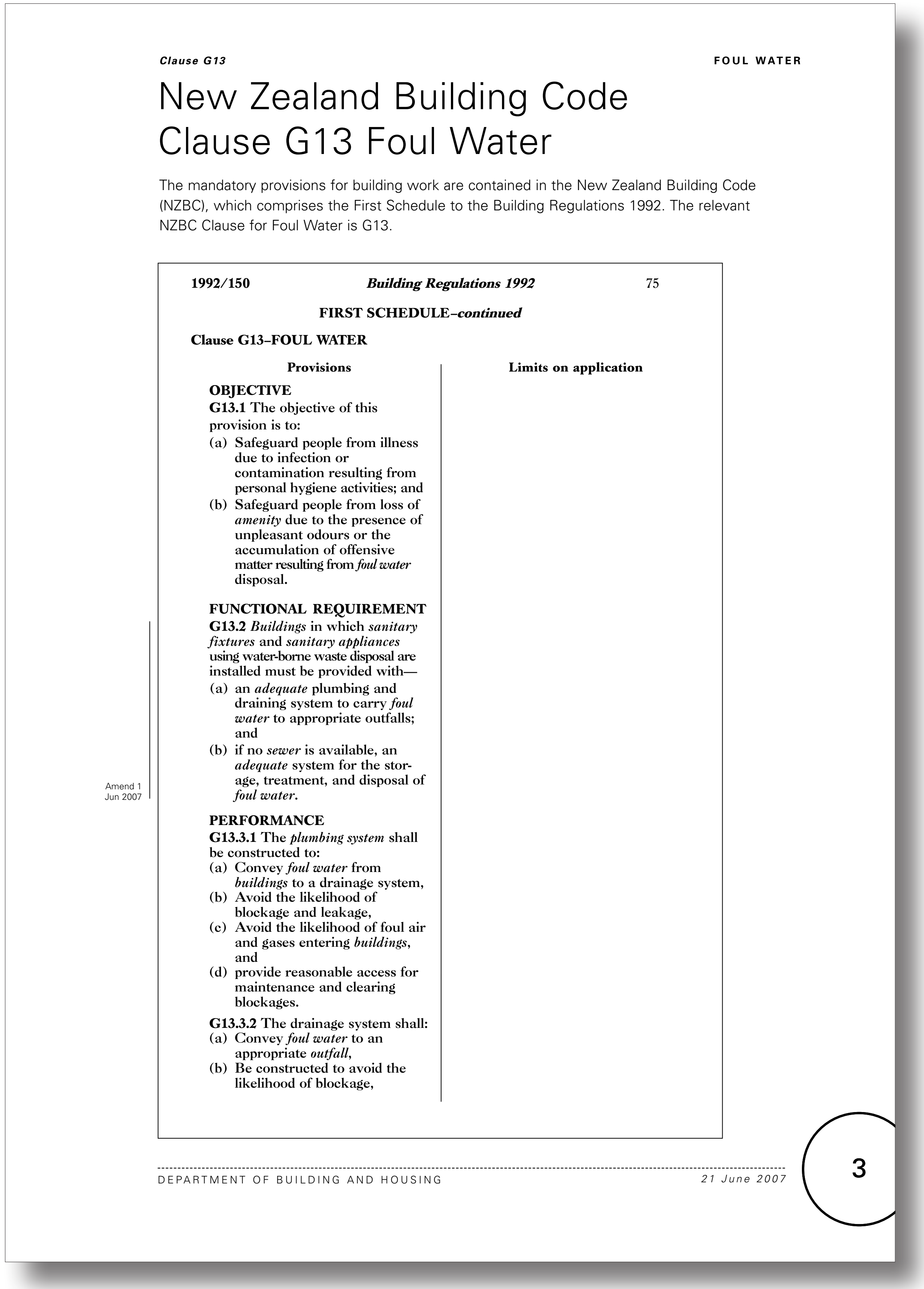
Amendment 10	Effective xx November 2022		

Note: Page numbers relate to the document at the time of Amendment and may not match page numbers in current document.

2B

Current G13 Foul Water - No changes proposed to this page



Clause G13 FOUL WATER

New Zealand Building Code Clause G13 Foul Water

The mandatory provisions for building work are contained in the New Zealand Building Code (NZBC), which comprises the First Schedule to the Building Regulations 1992. The relevant NZBC Clause for Foul Water is G13.

1992/150 *Building Regulations 1992* 75

FIRST SCHEDULE–*continued*

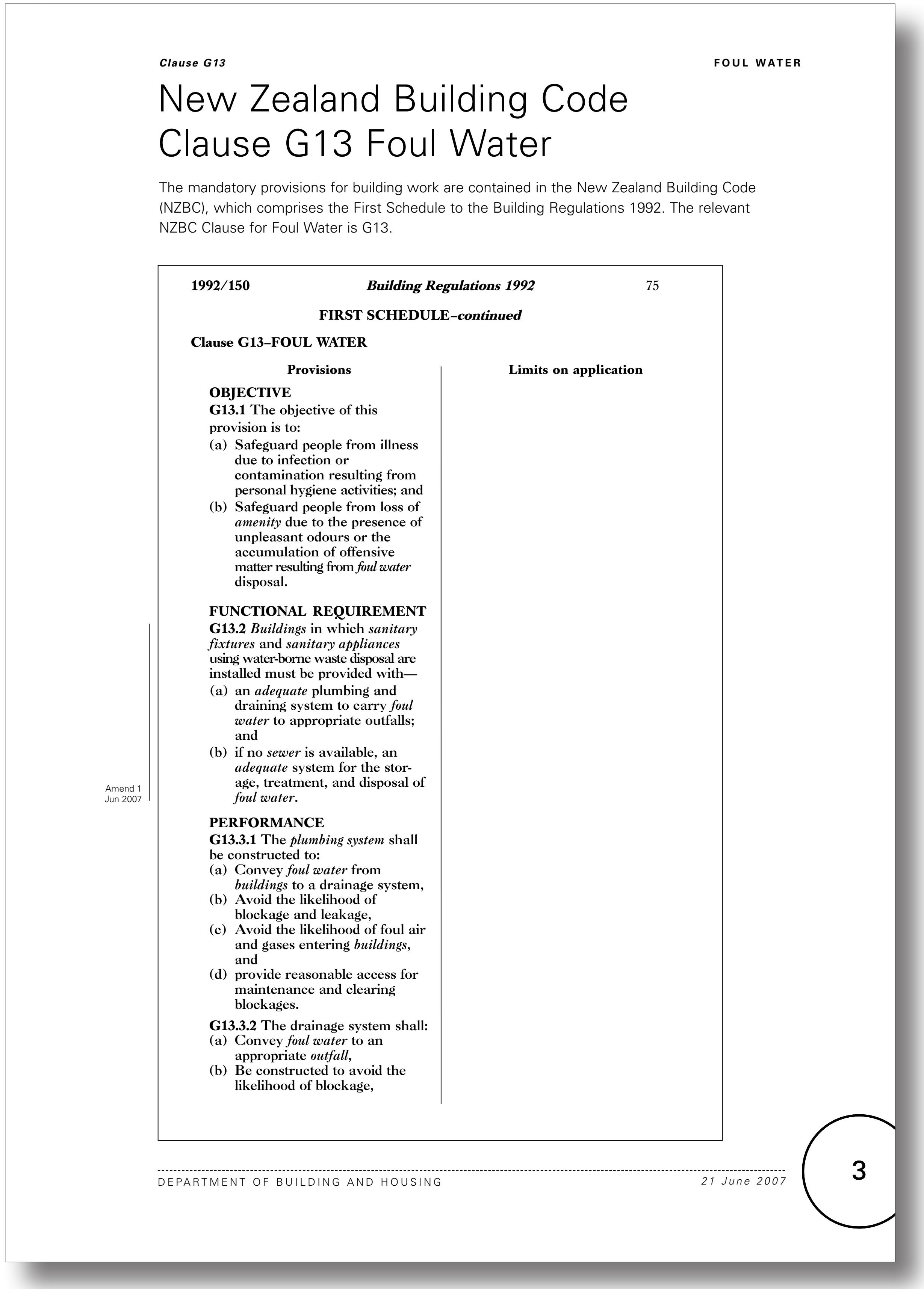
Clause G13–FOUL WATER

Provisions	Limits on application
OBJECTIVE **G13.1** The objective of this provision is to: (a) Safeguard people from illness due to infection or contamination resulting from personal hygiene activities; and (b) Safeguard people from loss of *amenity* due to the presence of unpleasant odours or the accumulation of offensive matter resulting from *foul water* disposal.	
FUNCTIONAL REQUIREMENT **G13.2** *Buildings* in which *sanitary fixtures* and *sanitary appliances* using water-borne waste disposal are installed must be provided with— (a) an *adequate* plumbing and draining system to carry *foul water* to appropriate outfalls; and (b) if no *sewer* is available, an *adequate* system for the storage, treatment, and disposal of *foul water*. Amend 1 Jun 2007	
PERFORMANCE **G13.3.1** The *plumbing system* shall be constructed to: (a) Convey *foul water* from *buildings* to a drainage system, (b) Avoid the likelihood of blockage and leakage, (c) Avoid the likelihood of foul air and gases entering *buildings*, and (d) provide reasonable access for maintenance and clearing blockages. **G13.3.2** The drainage system shall: (a) Convey *foul water* to an appropriate *outfall*, (b) Be constructed to avoid the likelihood of blockage,	

DEPARTMENT OF BUILDING AND HOUSING *21 June 2007*

3

Proposed G13 Foul Water - No changes proposed to this page



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1992/150 *Building Regulations 1992* 75

FIRST SCHEDULE–*continued*

Clause G13–FOUL WATER

Provisions / Limits on application

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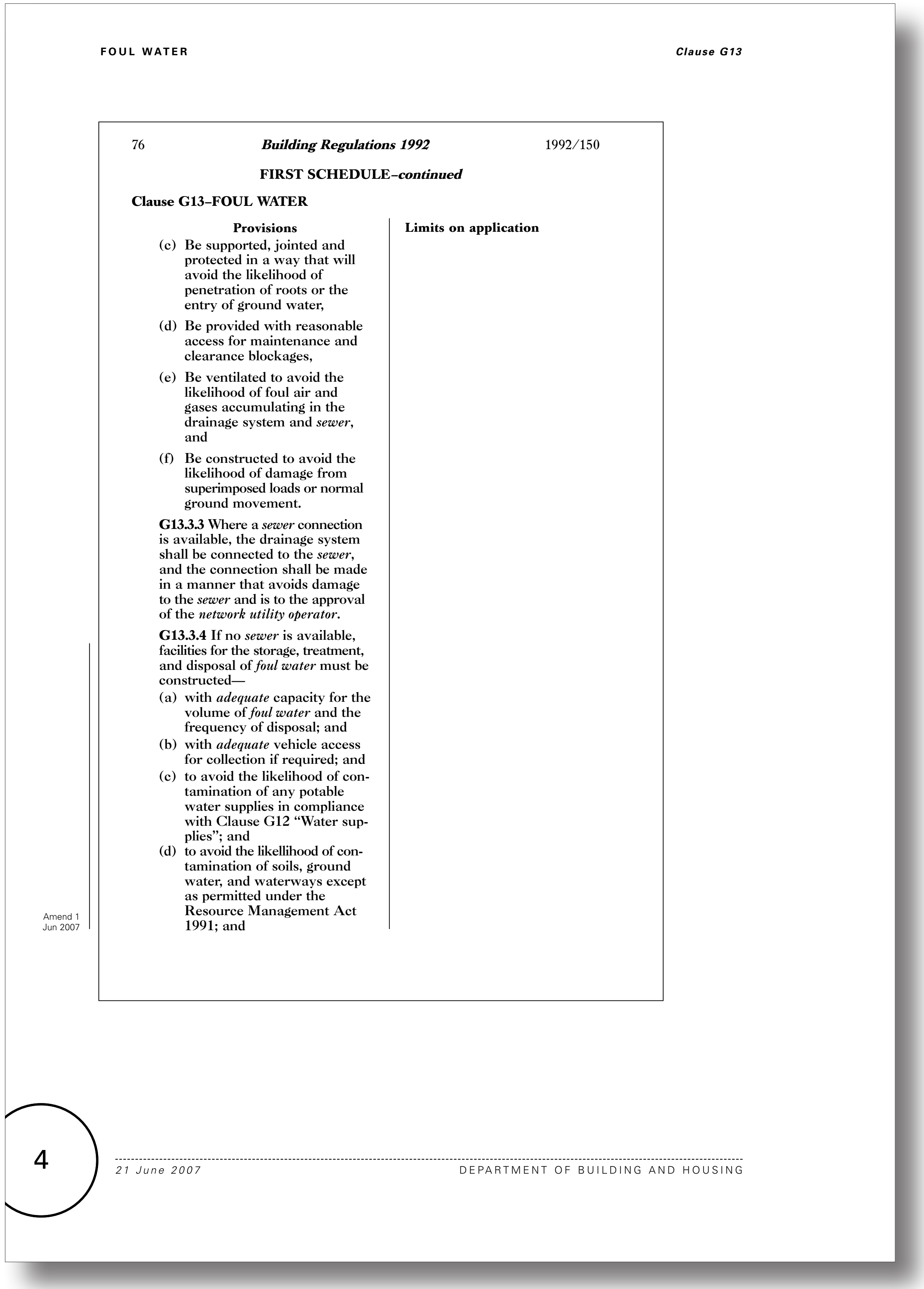
DEPARTMENT OF BUILDING AND HOUSING *21 June 2007*

3

Current G13 Foul Water - No changes proposed to this page



FOUL WATER Clause G13

76 *Building Regulations 1992* 1992/150

FIRST SCHEDULE–*continued*

Clause G13–FOUL WATER

Provisions | **Limits on application**

(c) Be supported, jointed and protected in a way that will avoid the likelihood of penetration of roots or the entry of ground water,

(d) Be provided with reasonable access for maintenance and clearance blockages,

(e) Be ventilated to avoid the likelihood of foul air and gases accumulating in the drainage system and *sewer*, and

(f) Be constructed to avoid the likelihood of damage from superimposed loads or normal ground movement.

G13.3.3 Where a *sewer* connection is available, the drainage system shall be connected to the *sewer*, and the connection shall be made in a manner that avoids damage to the *sewer* and is to the approval of the *network utility operator*.

G13.3.4 If no *sewer* is available, facilities for the storage, treatment, and disposal of *foul water* must be constructed—

(a) with *adequate* capacity for the volume of *foul water* and the frequency of disposal; and

(b) with *adequate* vehicle access for collection if required; and

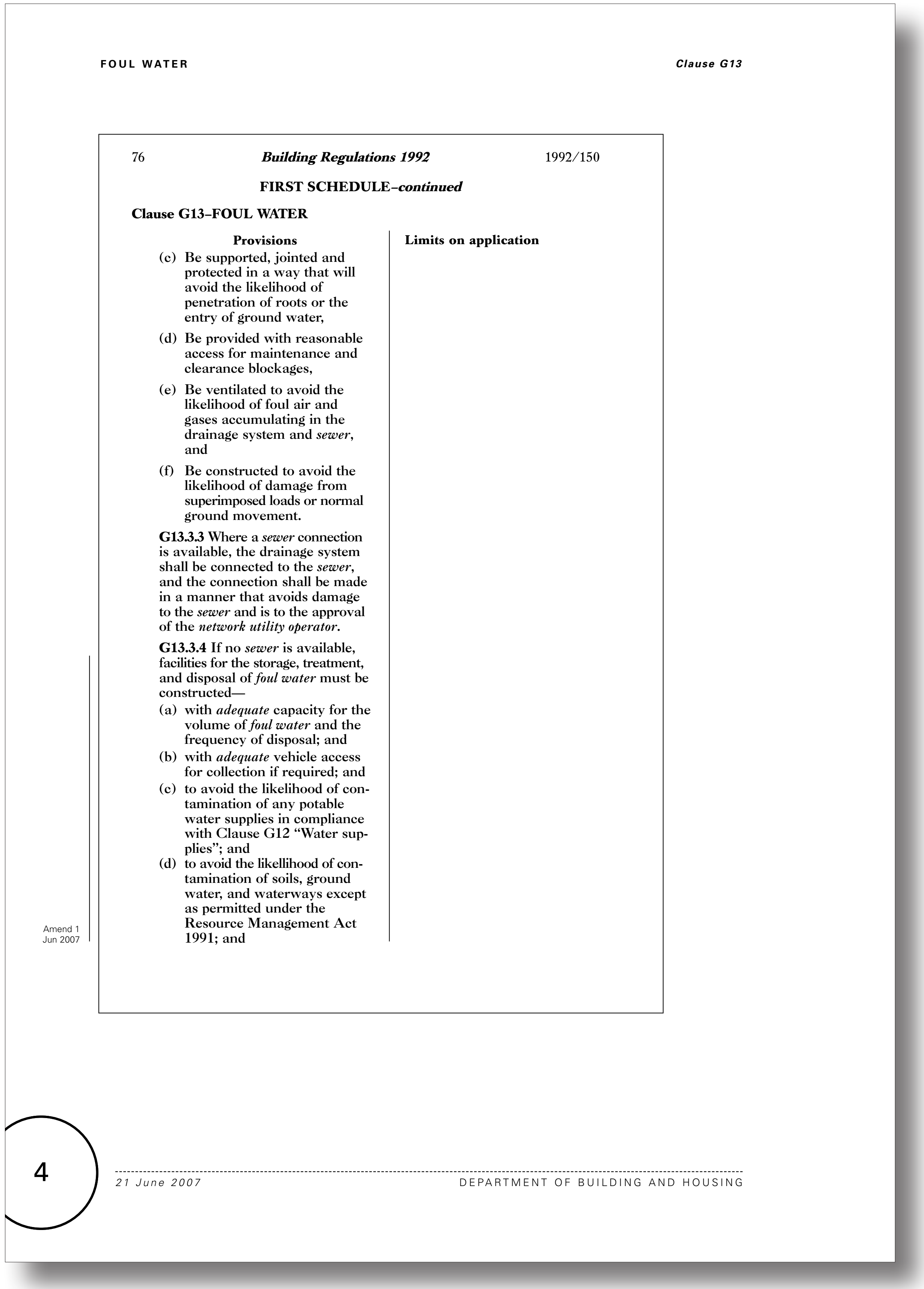
(c) to avoid the likelihood of contamination of any potable water supplies in compliance with Clause G12 "Water supplies"; and

(d) to avoid the likellihood of contamination of soils, ground water, and waterways except as permitted under the Resource Management Act 1991; and

Amend 1
Jun 2007

4 21 June 2007 DEPARTMENT OF BUILDING AND HOUSING

Proposed G13 Foul Water - No changes proposed to this page



FOUL WATER Clause G13

76 *Building Regulations 1992* 1992/150

FIRST SCHEDULE–*continued*

Clause G13–FOUL WATER

Provisions | **Limits on application**

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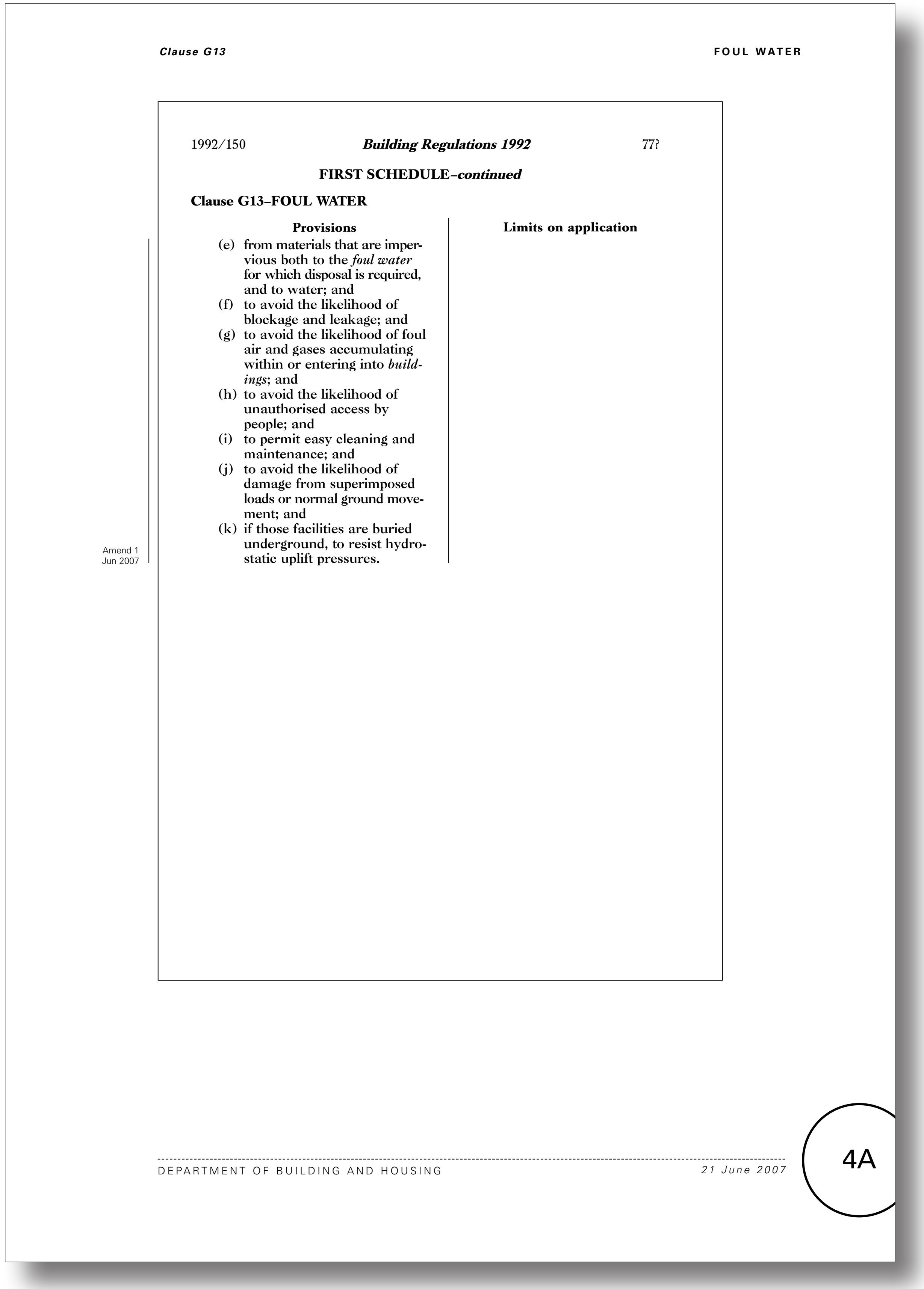
Amend 1
Jun 2007

4 21 June 2007 DEPARTMENT OF BUILDING AND HOUSING

Current G13 Foul Water - No changes proposed to this page



Clause G13 FOUL WATER

1992/150 *Building Regulations 1992* 77?

FIRST SCHEDULE–*continued*

Clause G13–FOUL WATER

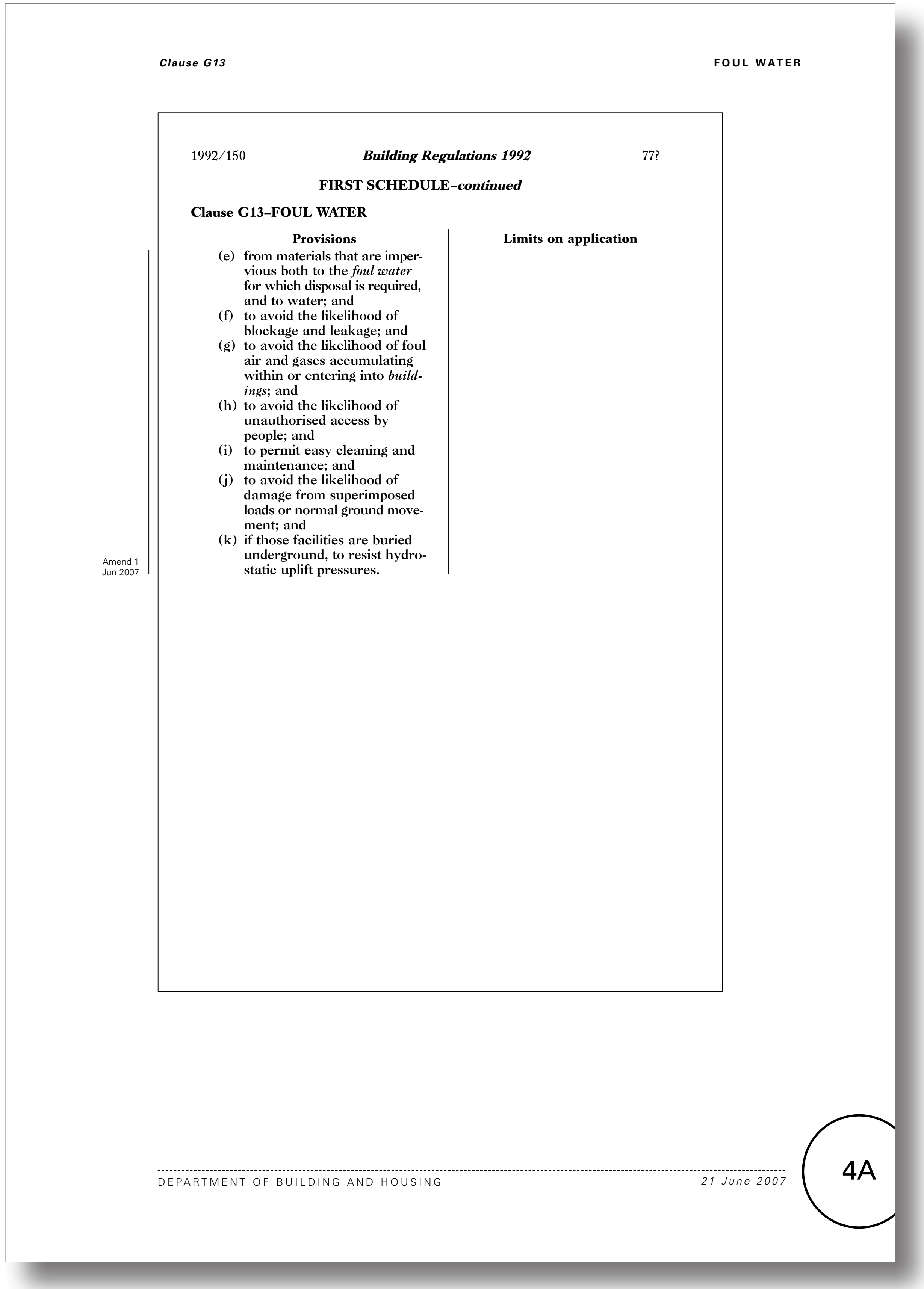
Provisions	Limits on application
(e) from materials that are impervious both to the *foul water* for which disposal is required, and to water; and (f) to avoid the likelihood of blockage and leakage; and (g) to avoid the likelihood of foul air and gases accumulating within or entering into *buildings*; and (h) to avoid the likelihood of unauthorised access by people; and (i) to permit easy cleaning and maintenance; and (j) to avoid the likelihood of damage from superimposed loads or normal ground movement; and (k) if those facilities are buried underground, to resist hydrostatic uplift pressures.	

Amend 1 Jun 2007

DEPARTMENT OF BUILDING AND HOUSING *21 June 2007*

4A

Proposed G13 Foul Water - No changes proposed to this page



Clause G13 FOUL WATER

1992/150 *Building Regulations 1992* 77?

FIRST SCHEDULE–*continued*

Clause G13–FOUL WATER

Provisions	Limits on application
(e) from materials that are impervious both to the *foul water* for which disposal is required, and to water; and (f) to avoid the likelihood of blockage and leakage; and (g) to avoid the likelihood of foul air and gases accumulating within or entering into *buildings*; and (h) to avoid the likelihood of unauthorised access by people; and (i) to permit easy cleaning and maintenance; and (j) to avoid the likelihood of damage from superimposed loads or normal ground movement; and (k) if those facilities are buried underground, to resist hydrostatic uplift pressures.	

Amend 1 Jun 2007

DEPARTMENT OF BUILDING AND HOUSING *21 June 2007*

4A

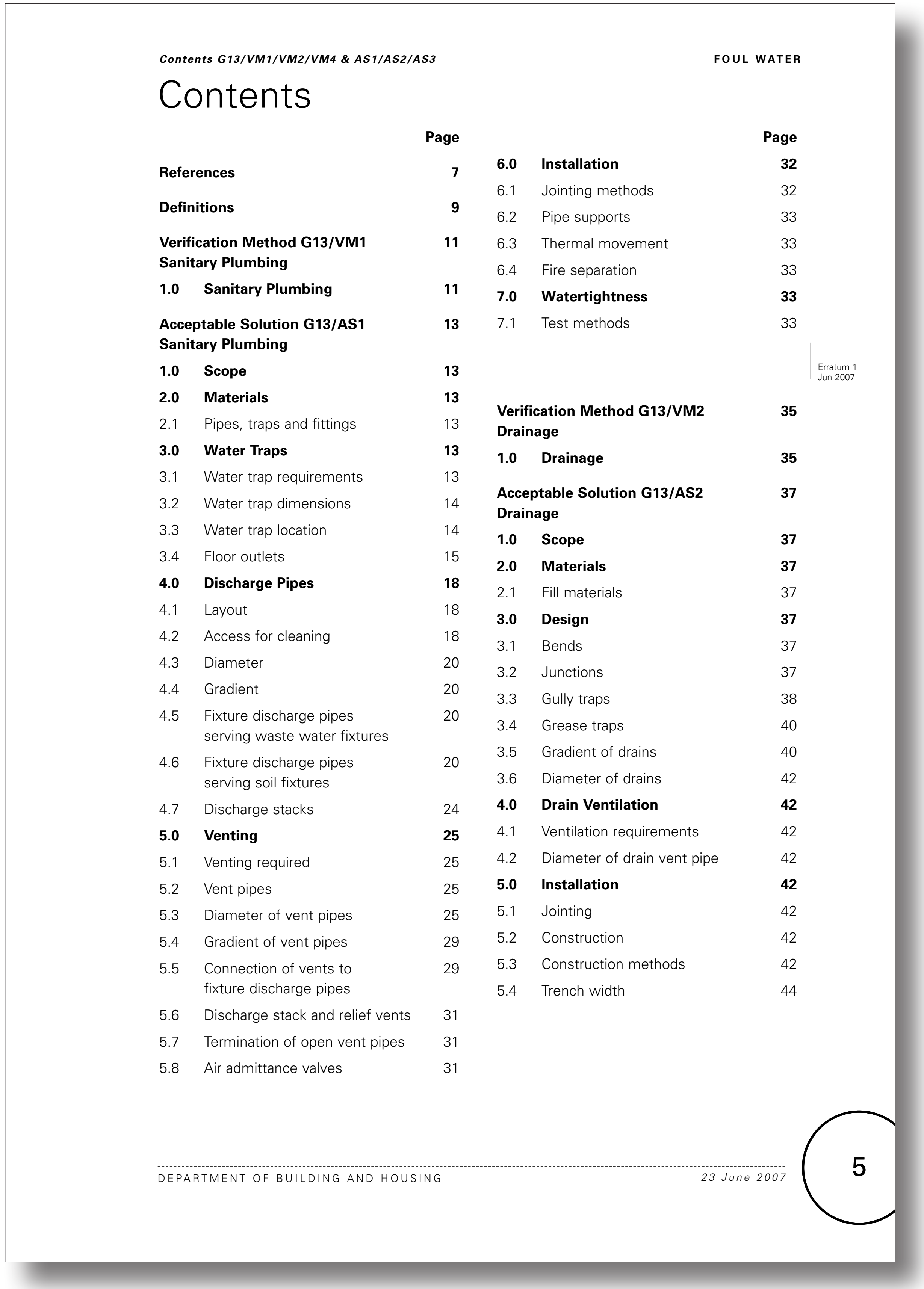
Current G13 Foul Water - No changes proposed to this page

4B

Proposed G13 Foul Water - No changes proposed to this page

4B

Current G13 Foul Water - No changes proposed to this page



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Jun 2007

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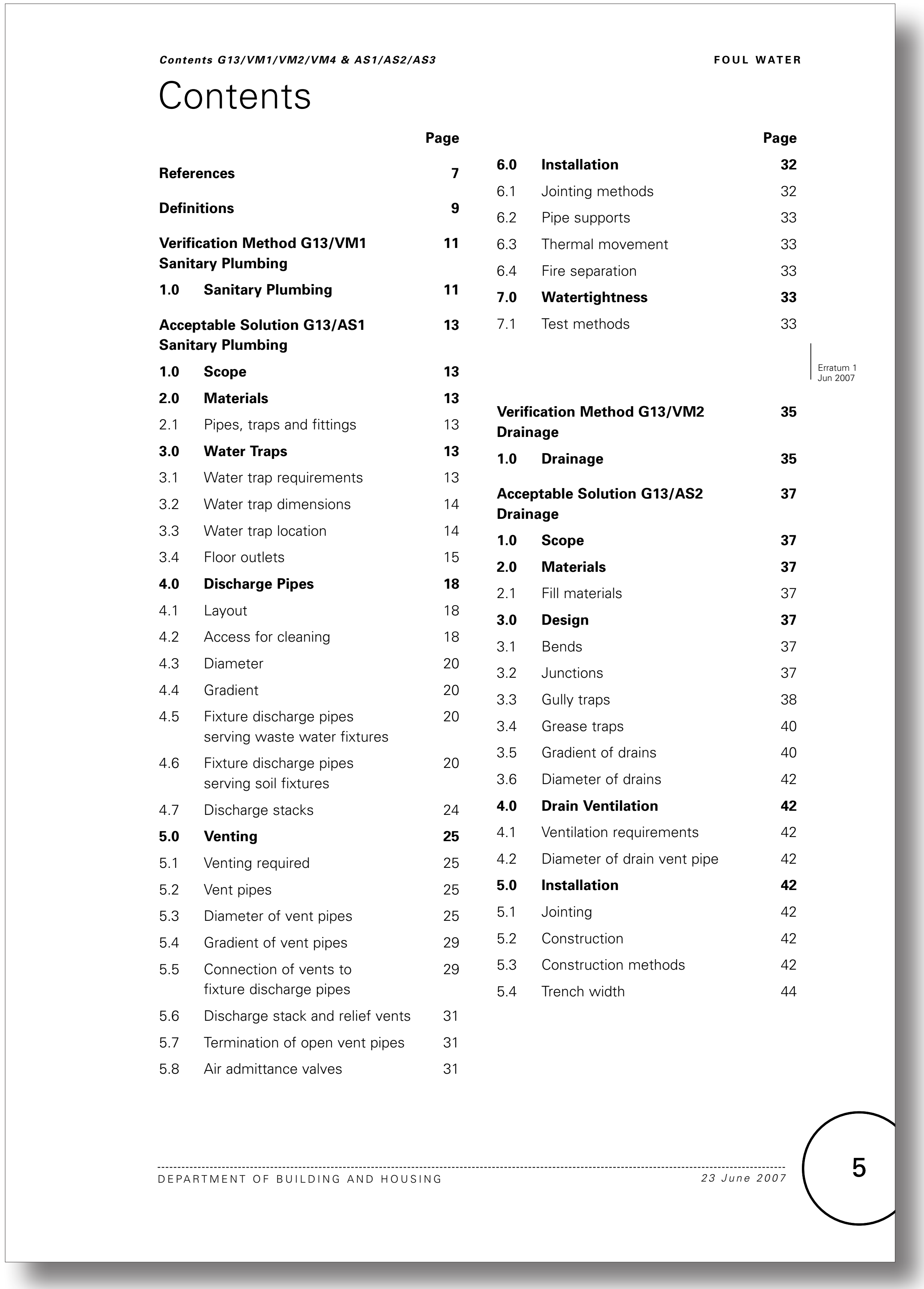

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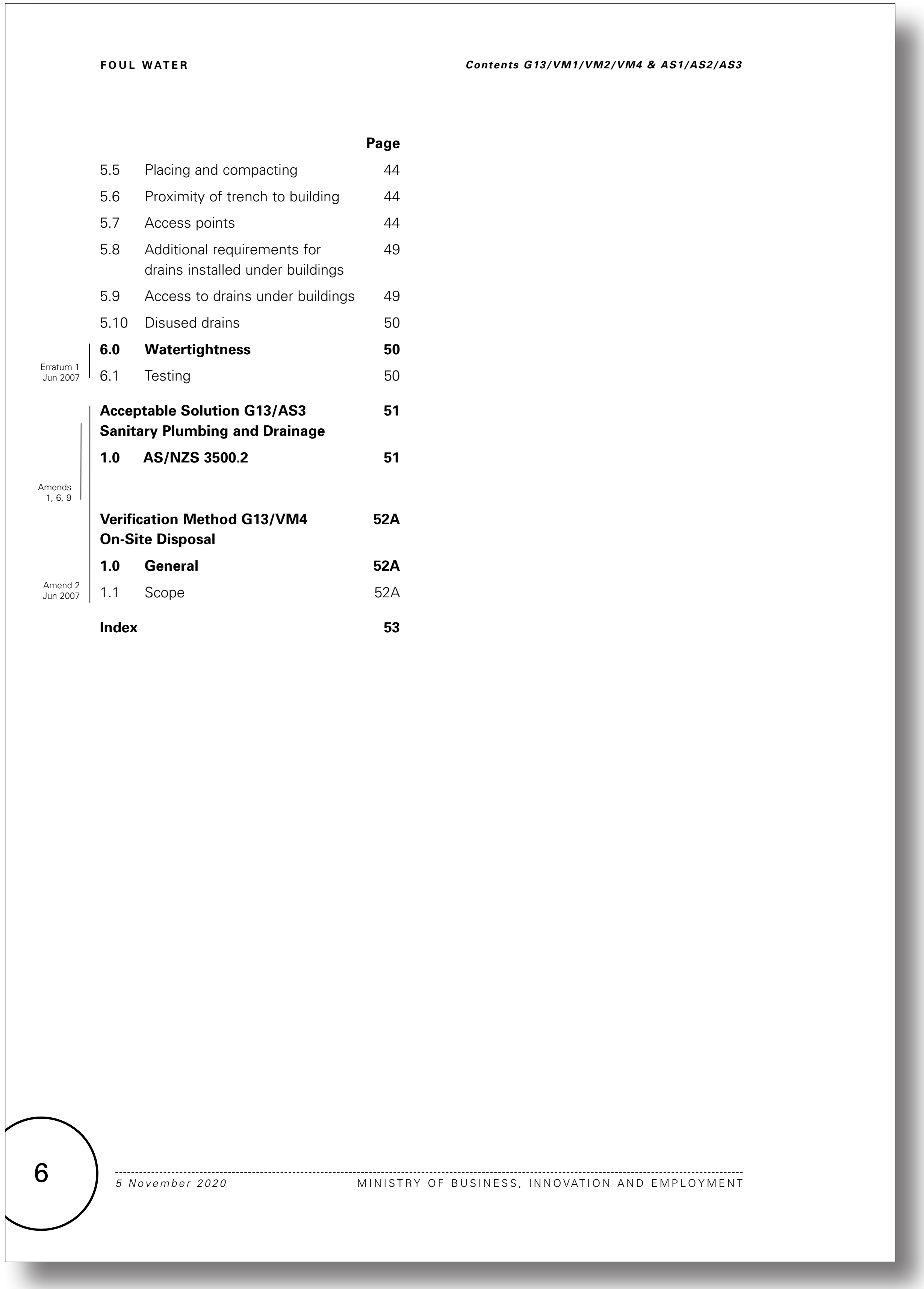

Erratum 1 Jun 2007

Amends 1, 6, 9

Amend 2 Jun 2007

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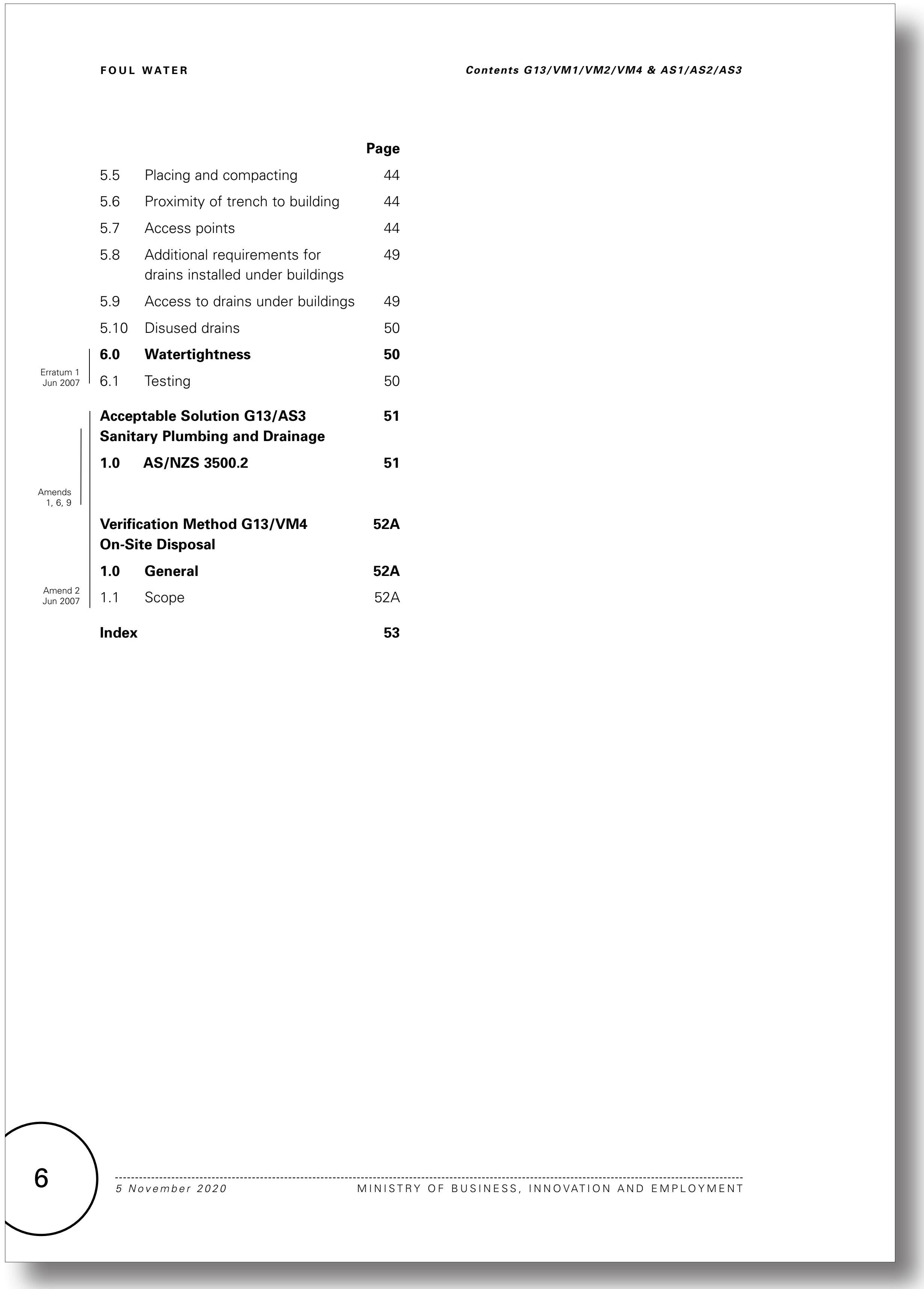

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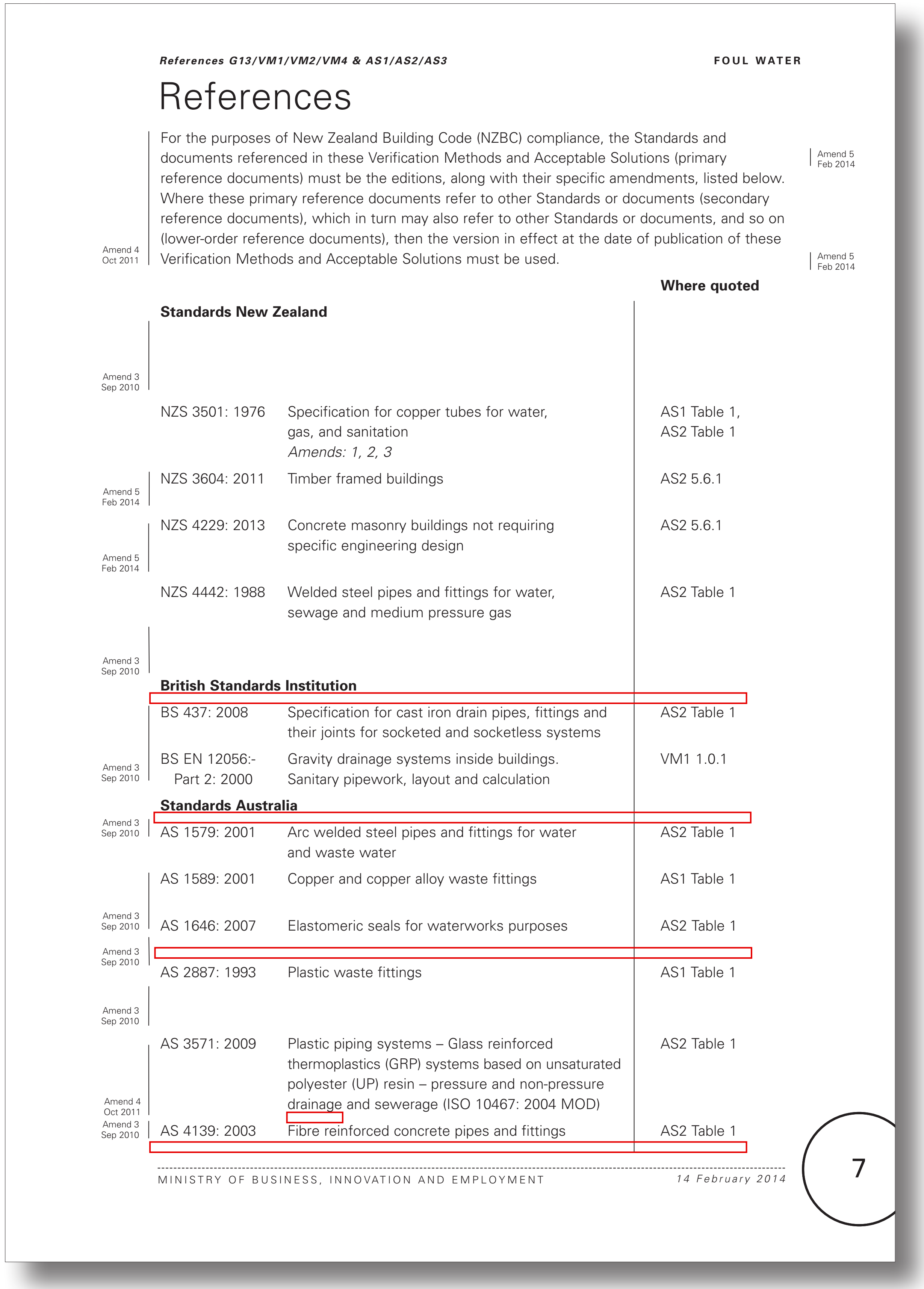
Appendix C. Proposed changes to the acceptable solutions and verification methods for clause G13 Foul Water

Current G13 Foul Water acceptable solutions and verification methods

(Text to be amended shown in red)



References

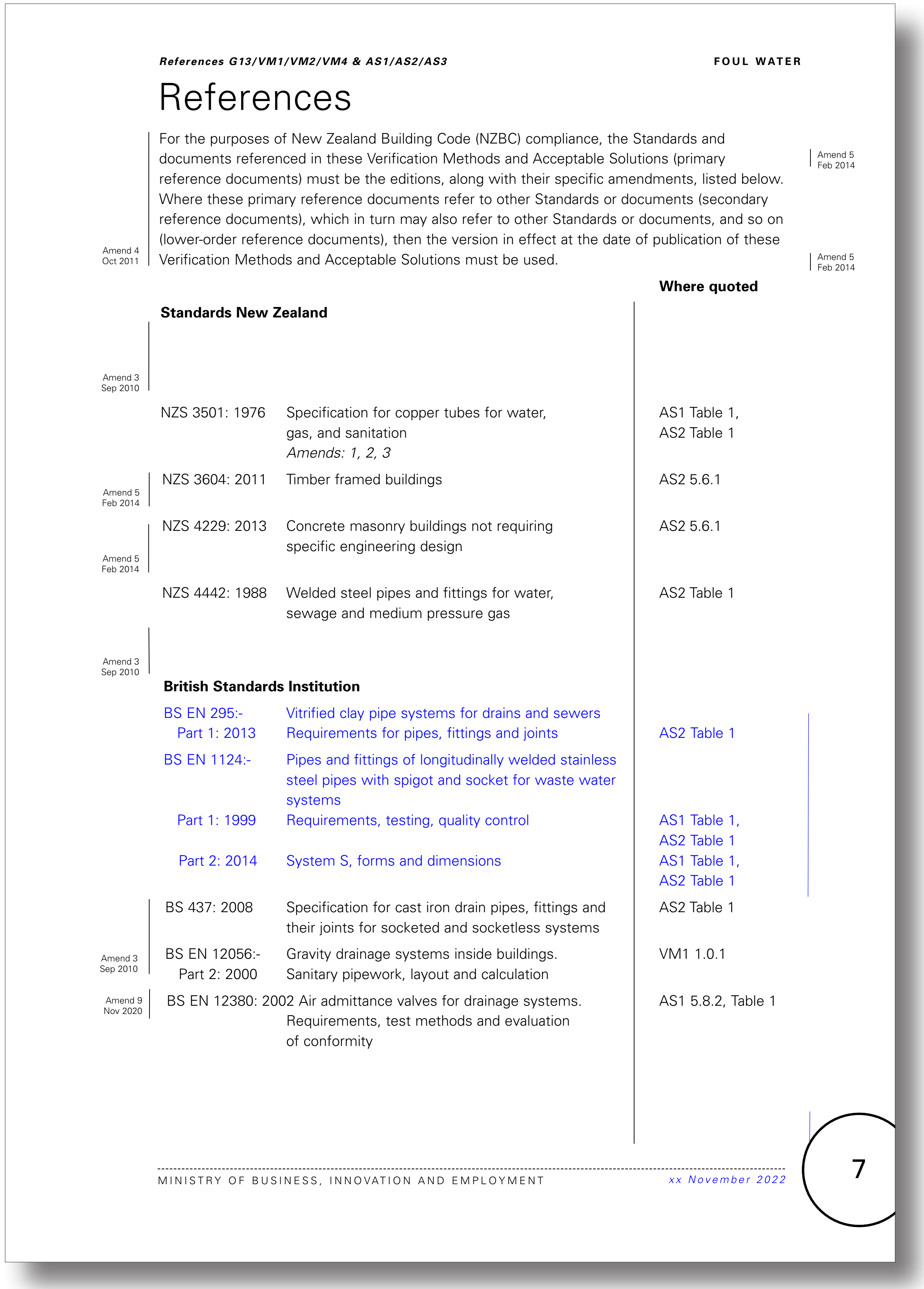
For the purposes of New Zealand Building Code (NZBC) compliance, the Standards and documents referenced in these Verification Methods and Acceptable Solutions (primary reference documents) must be the editions, along with their specific amendments, listed below. Where these primary reference documents refer to other Standards or documents (secondary reference documents), which in turn may also refer to other Standards or documents, and so on (lower-order reference documents), then the version in effect at the date of publication of these Verification Methods and Acceptable Solutions must be used.

Amend 5 Feb 2014 · Amend 4 Oct 2011 · Amend 5 Feb 2014

		Where quoted
Standards New Zealand		
NZS 3501: 1976	Specification for copper tubes for water, gas, and sanitation *Amends: 1, 2, 3*	AS1 Table 1, AS2 Table 1
NZS 3604: 2011	Timber framed buildings	AS2 5.6.1
NZS 4229: 2013	Concrete masonry buildings not requiring specific engineering design	AS2 5.6.1
NZS 4442: 1988	Welded steel pipes and fittings for water, sewage and medium pressure gas	AS2 Table 1
British Standards Institution		
BS 437: 2008	Specification for cast iron drain pipes, fittings and their joints for socketed and socketless systems	AS2 Table 1
BS EN 12056:- Part 2: 2000	Gravity drainage systems inside buildings. Sanitary pipework, layout and calculation	VM1 1.0.1
Standards Australia		
AS 1579: 2001	Arc welded steel pipes and fittings for water and waste water	AS2 Table 1
AS 1589: 2001	Copper and copper alloy waste fittings	AS1 Table 1
AS 1646: 2007	Elastomeric seals for waterworks purposes	AS2 Table 1
AS 2887: 1993	Plastic waste fittings	AS1 Table 1
AS 3571: 2009	Plastic piping systems – Glass reinforced thermoplastics (GRP) systems based on unsaturated polyester (UP) resin – pressure and non-pressure drainage and sewerage (ISO 10467: 2004 MOD)	AS2 Table 1
AS 4139: 2003	Fibre reinforced concrete pipes and fittings	AS2 Table 1

Amend 3 Sep 2010 · Amend 5 Feb 2014 · Amend 5 Feb 2014 · Amend 3 Sep 2010 · Amend 3 Sep 2010 · Amend 3 Sep 2010 · Amend 3 Sep 2010 · Amend 3 Sep 2010 · Amend 3 Sep 2010 · Amend 4 Oct 2011 · Amend 3 Sep 2010

Proposed amendments to G13 Foul Water acceptable solutions and verification methods (Proposed text in blue)



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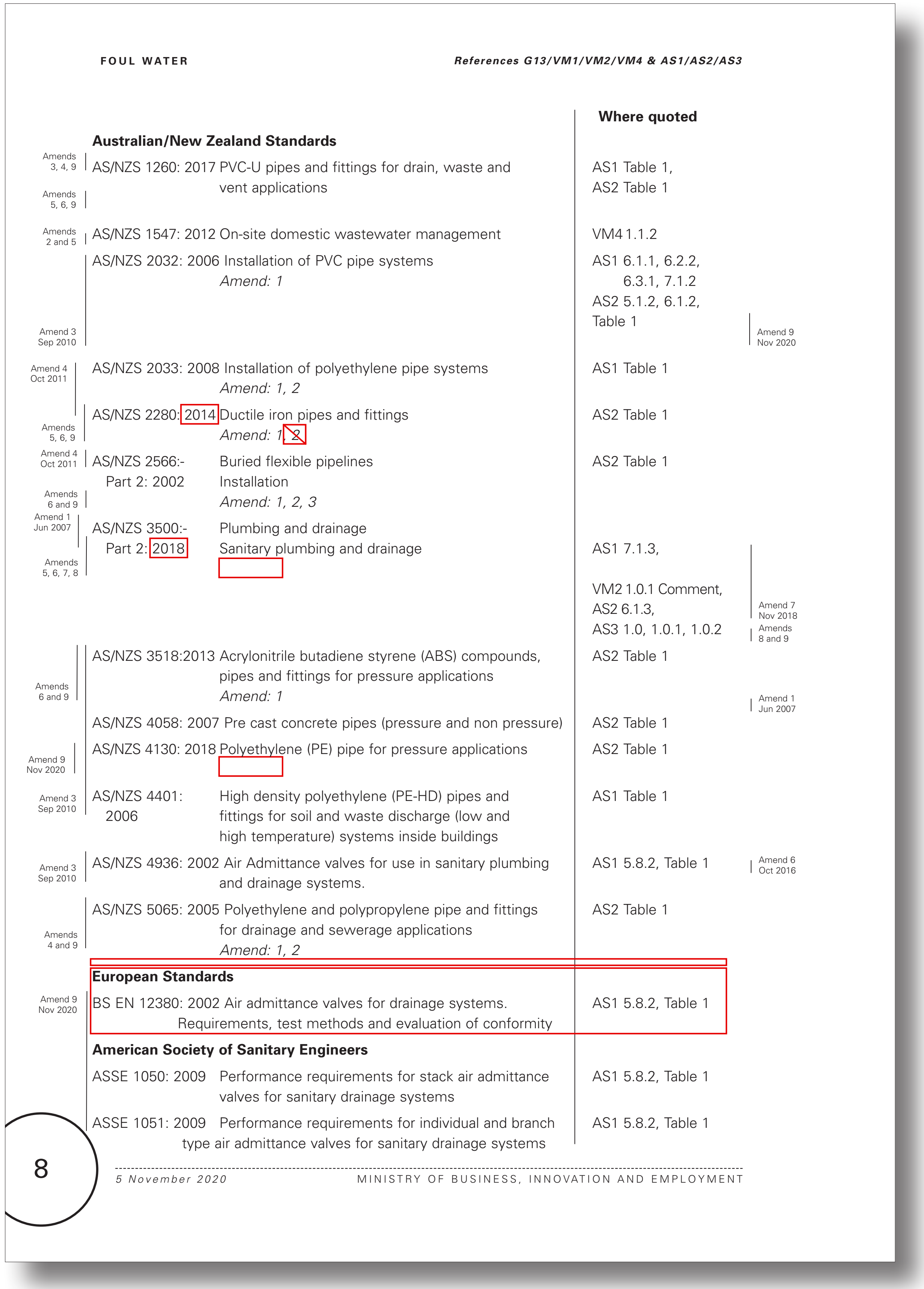
Amend 5 Feb 2014 · Amend 4 Oct 2011 · Amend 5 Feb 2014

		Where quoted
Standards New Zealand		
NZS 3501: 1976	Specification for copper tubes for water, gas, and sanitation *Amends: 1, 2, 3*	AS1 Table 1, AS2 Table 1
NZS 3604: 2011	Timber framed buildings	AS2 5.6.1
NZS 4229: 2013	Concrete masonry buildings not requiring specific engineering design	AS2 5.6.1
NZS 4442: 1988	Welded steel pipes and fittings for water, sewage and medium pressure gas	AS2 Table 1
British Standards Institution		
BS EN 295:-	Vitrified clay pipe systems for drains and sewers	
Part 1: 2013	Requirements for pipes, fittings and joints	AS2 Table 1
BS EN 1124:-	Pipes and fittings of longitudinally welded stainless steel pipes with spigot and socket for waste water systems	
Part 1: 1999	Requirements, testing, quality control	AS1 Table 1, AS2 Table 1
Part 2: 2014	System S, forms and dimensions	AS1 Table 1, AS2 Table 1
BS 437: 2008	Specification for cast iron drain pipes, fittings and their joints for socketed and socketless systems	AS2 Table 1
BS EN 12056:- Part 2: 2000	Gravity drainage systems inside buildings. Sanitary pipework, layout and calculation	VM1 1.0.1
BS EN 12380: 2002	Air admittance valves for drainage systems. Requirements, test methods and evaluation of conformity	AS1 5.8.2, Table 1

Amend 3 Sep 2010 · Amend 5 Feb 2014 · Amend 5 Feb 2014 · Amend 3 Sep 2010 · Amend 3 Sep 2010 · Amend 9 Nov 2020

Current G13 Foul Water acceptable solutions and verification methods

(Text to be amended shown in red)



FOUL WATER

References G13/VM1/VM2/VM4 & AS1/AS2/AS3

			Where quoted	
	Australian/New Zealand Standards			
Amends 3, 4, 9 Amends 5, 6, 9	AS/NZS 1260: 2017	PVC-U pipes and fittings for drain, waste and vent applications	AS1 Table 1, AS2 Table 1	
Amends 2 and 5	AS/NZS 1547: 2012	On-site domestic wastewater management	VM4 1.1.2	
Amend 3 Sep 2010	AS/NZS 2032: 2006	Installation of PVC pipe systems *Amend: 1*	AS1 6.1.1, 6.2.2, 6.3.1, 7.1.2 AS2 5.1.2, 6.1.2, Table 1	Amend 9 Nov 2020
Amend 4 Oct 2011	AS/NZS 2033: 2008	Installation of polyethylene pipe systems *Amend: 1, 2*	AS1 Table 1	
Amends 5, 6, 9	AS/NZS 2280: 2014	Ductile iron pipes and fittings *Amend: 1~~, 2~~*	AS2 Table 1	
Amend 4 Oct 2011 Amends 6 and 9	AS/NZS 2566:- Part 2: 2002	Buried flexible pipelines Installation *Amend: 1, 2, 3*	AS2 Table 1	
Amend 1 Jun 2007 Amends 5, 6, 7, 8	AS/NZS 3500:- Part 2: 2018	Plumbing and drainage Sanitary plumbing and drainage	AS1 7.1.3, VM2 1.0.1 Comment, AS2 6.1.3, AS3 1.0, 1.0.1, 1.0.2	Amend 7 Nov 2018 Amends 8 and 9
Amends 6 and 9	AS/NZS 3518:2013	Acrylonitrile butadiene styrene (ABS) compounds, pipes and fittings for pressure applications *Amend: 1*	AS2 Table 1	Amend 1 Jun 2007
	AS/NZS 4058: 2007	Pre cast concrete pipes (pressure and non pressure)	AS2 Table 1	
Amend 9 Nov 2020	AS/NZS 4130: 2018	Polyethylene (PE) pipe for pressure applications	AS2 Table 1	
Amend 3 Sep 2010	AS/NZS 4401: 2006	High density polyethylene (PE-HD) pipes and fittings for soil and waste discharge (low and high temperature) systems inside buildings	AS1 Table 1	
Amend 3 Sep 2010	AS/NZS 4936: 2002	Air Admittance valves for use in sanitary plumbing and drainage systems.	AS1 5.8.2, Table 1	Amend 6 Oct 2016
Amends 4 and 9	AS/NZS 5065: 2005	Polyethylene and polypropylene pipe and fittings for drainage and sewerage applications *Amend: 1, 2*	AS2 Table 1	
	European Standards			
Amend 9 Nov 2020	BS EN 12380: 2002	Air admittance valves for drainage systems. Requirements, test methods and evaluation of conformity	AS1 5.8.2, Table 1	
	American Society of Sanitary Engineers			
	ASSE 1050: 2009	Performance requirements for stack air admittance valves for sanitary drainage systems	AS1 5.8.2, Table 1	
	ASSE 1051: 2009	Performance requirements for individual and branch type air admittance valves for sanitary drainage systems	AS1 5.8.2, Table 1	

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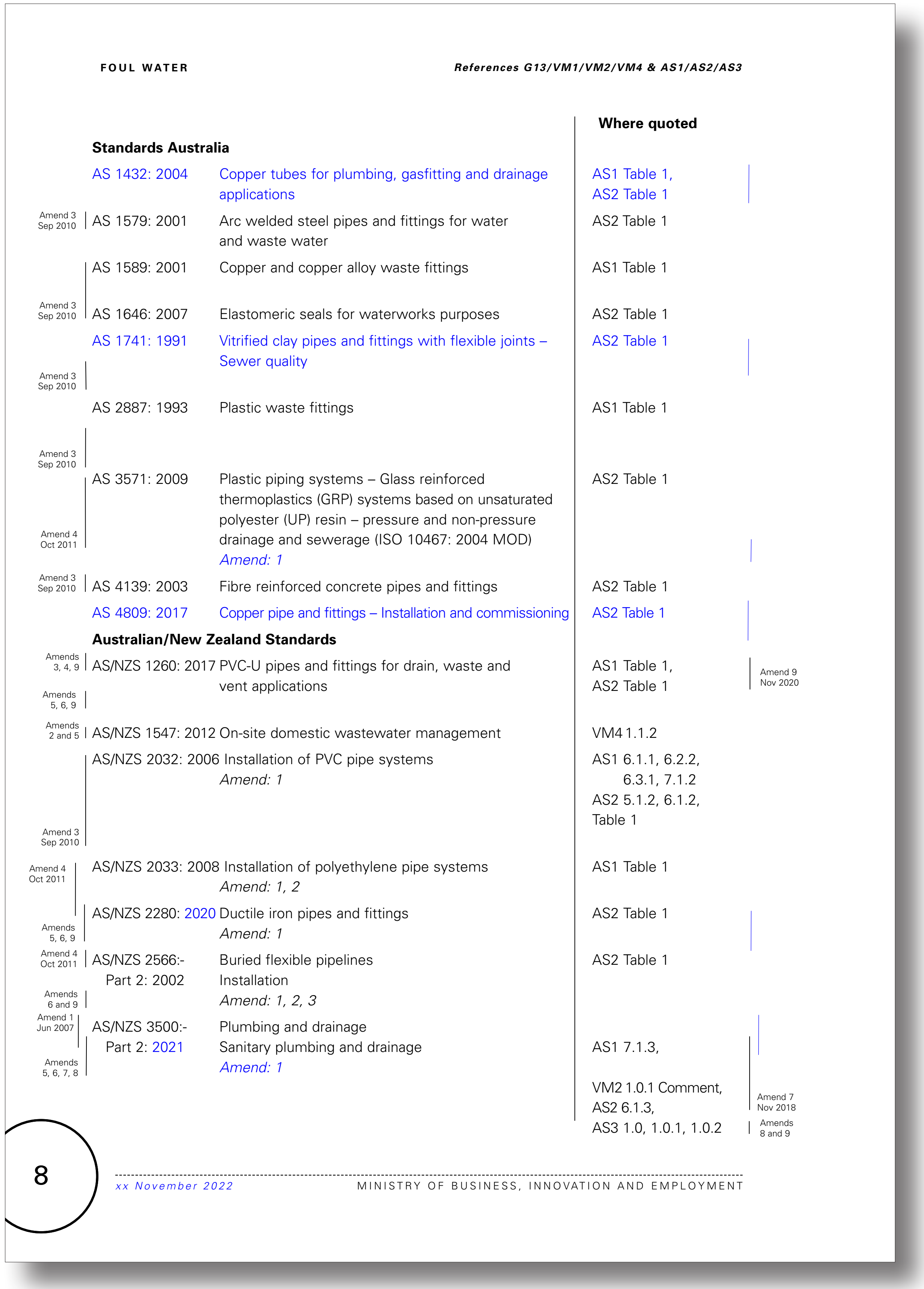
5 November 2020 MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Proposed amendments to G13 Foul Water acceptable solutions and verification methods

(Proposed text in blue)



FOUL WATER

References G13/VM1/VM2/VM4 & AS1/AS2/AS3

			Where quoted	
	Standards Australia			
	AS 1432: 2004	Copper tubes for plumbing, gasfitting and drainage applications	AS1 Table 1, AS2 Table 1	
Amend 3 Sep 2010	AS 1579: 2001	Arc welded steel pipes and fittings for water and waste water	AS2 Table 1	
	AS 1589: 2001	Copper and copper alloy waste fittings	AS1 Table 1	
Amend 3 Sep 2010	AS 1646: 2007	Elastomeric seals for waterworks purposes	AS2 Table 1	
	AS 1741: 1991	Vitrified clay pipes and fittings with flexible joints – Sewer quality	AS2 Table 1	
Amend 3 Sep 2010	AS 2887: 1993	Plastic waste fittings	AS1 Table 1	
Amend 3 Sep 2010 Amend 4 Oct 2011	AS 3571: 2009	Plastic piping systems – Glass reinforced thermoplastics (GRP) systems based on unsaturated polyester (UP) resin – pressure and non-pressure drainage and sewerage (ISO 10467: 2004 MOD) *Amend: 1*	AS2 Table 1	
Amend 3 Sep 2010	AS 4139: 2003	Fibre reinforced concrete pipes and fittings	AS2 Table 1	
	AS 4809: 2017	Copper pipe and fittings – Installation and commissioning	AS2 Table 1	
	Australian/New Zealand Standards			
Amends 3, 4, 9 Amends 5, 6, 9	AS/NZS 1260: 2017	PVC-U pipes and fittings for drain, waste and vent applications	AS1 Table 1, AS2 Table 1	Amend 9 Nov 2020
Amends 2 and 5	AS/NZS 1547: 2012	On-site domestic wastewater management	VM4 1.1.2	
Amend 3 Sep 2010	AS/NZS 2032: 2006	Installation of PVC pipe systems *Amend: 1*	AS1 6.1.1, 6.2.2, 6.3.1, 7.1.2 AS2 5.1.2, 6.1.2, Table 1	
Amend 4 Oct 2011	AS/NZS 2033: 2008	Installation of polyethylene pipe systems *Amend: 1, 2*	AS1 Table 1	
Amends 5, 6, 9	AS/NZS 2280: 2020	Ductile iron pipes and fittings *Amend: 1*	AS2 Table 1	
Amend 4 Oct 2011 Amends 6 and 9	AS/NZS 2566:- Part 2: 2002	Buried flexible pipelines Installation *Amend: 1, 2, 3*	AS2 Table 1	
Amend 1 Jun 2007 Amends 5, 6, 7, 8	AS/NZS 3500:- Part 2: 2021	Plumbing and drainage Sanitary plumbing and drainage *Amend: 1*	AS1 7.1.3, VM2 1.0.1 Comment, AS2 6.1.3, AS3 1.0, 1.0.1, 1.0.2	Amend 7 Nov 2018 Amends 8 and 9

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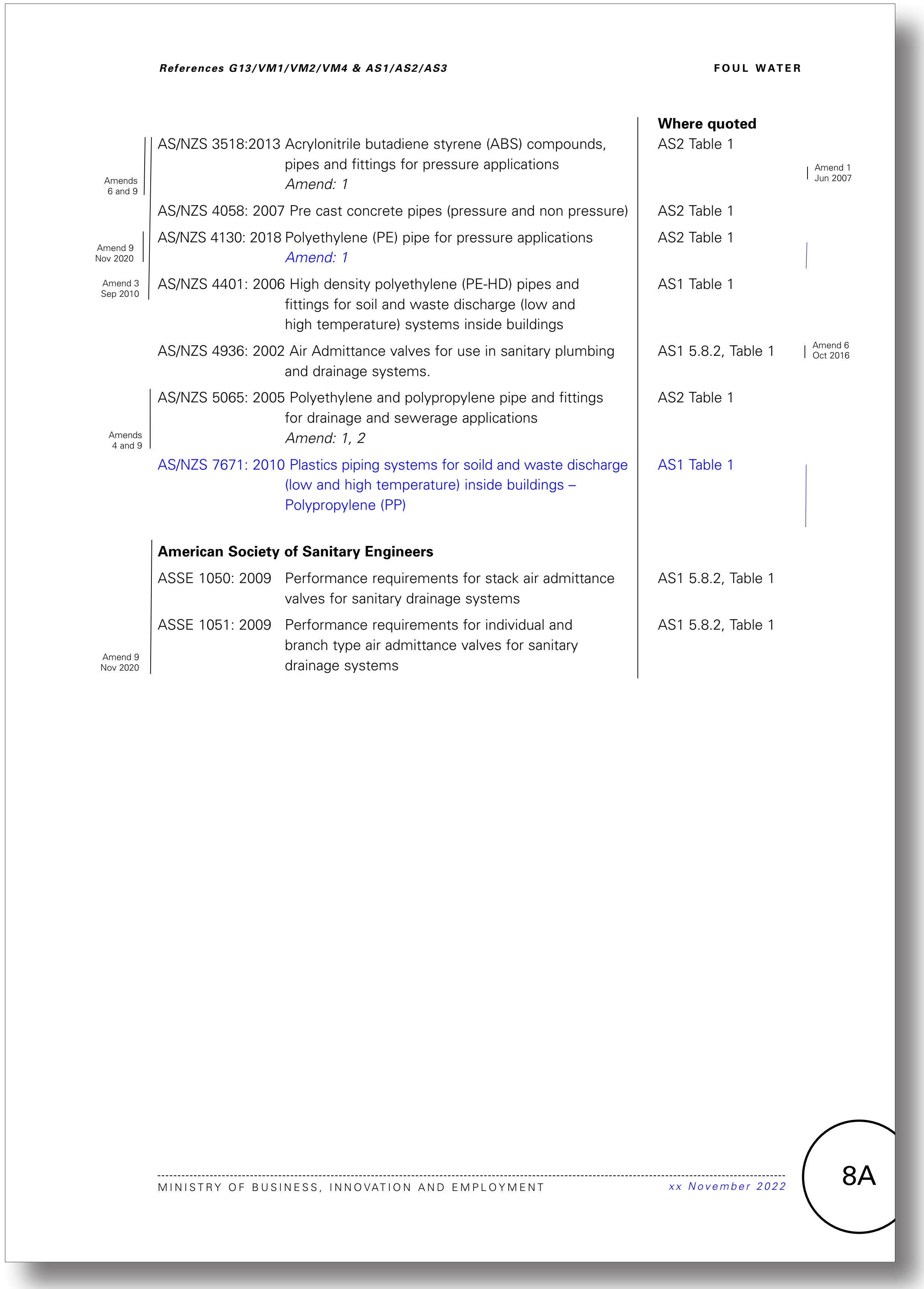
xx November 2022 MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Current G13 Foul Water acceptable solutions and verification methods
(Text to be amended shown in red)

Proposed amendments to G13 Foul Water acceptable solutions and verification methods (Proposed text in blue)



			Where quoted	
Amends 6 and 9	AS/NZS 3518:2013	Acrylonitrile butadiene styrene (ABS) compounds, pipes and fittings for pressure applications *Amend: 1*	AS2 Table 1	Amend 1 Jun 2007
	AS/NZS 4058: 2007	Pre cast concrete pipes (pressure and non pressure)	AS2 Table 1	
Amend 9 Nov 2020	AS/NZS 4130: 2018	Polyethylene (PE) pipe for pressure applications *Amend: 1*	AS2 Table 1	
Amend 3 Sep 2010	AS/NZS 4401: 2006	High density polyethylene (PE-HD) pipes and fittings for soil and waste discharge (low and high temperature) systems inside buildings	AS1 Table 1	
	AS/NZS 4936: 2002	Air Admittance valves for use in sanitary plumbing and drainage systems.	AS1 5.8.2, Table 1	Amend 6 Oct 2016
Amends 4 and 9	AS/NZS 5065: 2005	Polyethylene and polypropylene pipe and fittings for drainage and sewerage applications *Amend: 1, 2*	AS2 Table 1	
	AS/NZS 7671: 2010	Plastics piping systems for soild and waste discharge (low and high temperature) inside buildings – Polypropylene (PP)	AS1 Table 1	
	American Society of Sanitary Engineers			
	ASSE 1050: 2009	Performance requirements for stack air admittance valves for sanitary drainage systems	AS1 5.8.2, Table 1	
Amend 9 Nov 2020	ASSE 1051: 2009	Performance requirements for individual and branch type air admittance valves for sanitary drainage systems	AS1 5.8.2, Table 1	

Current G13 Foul Water - No changes proposed to this page

Proposed G13 Foul Water - No changes proposed to this page

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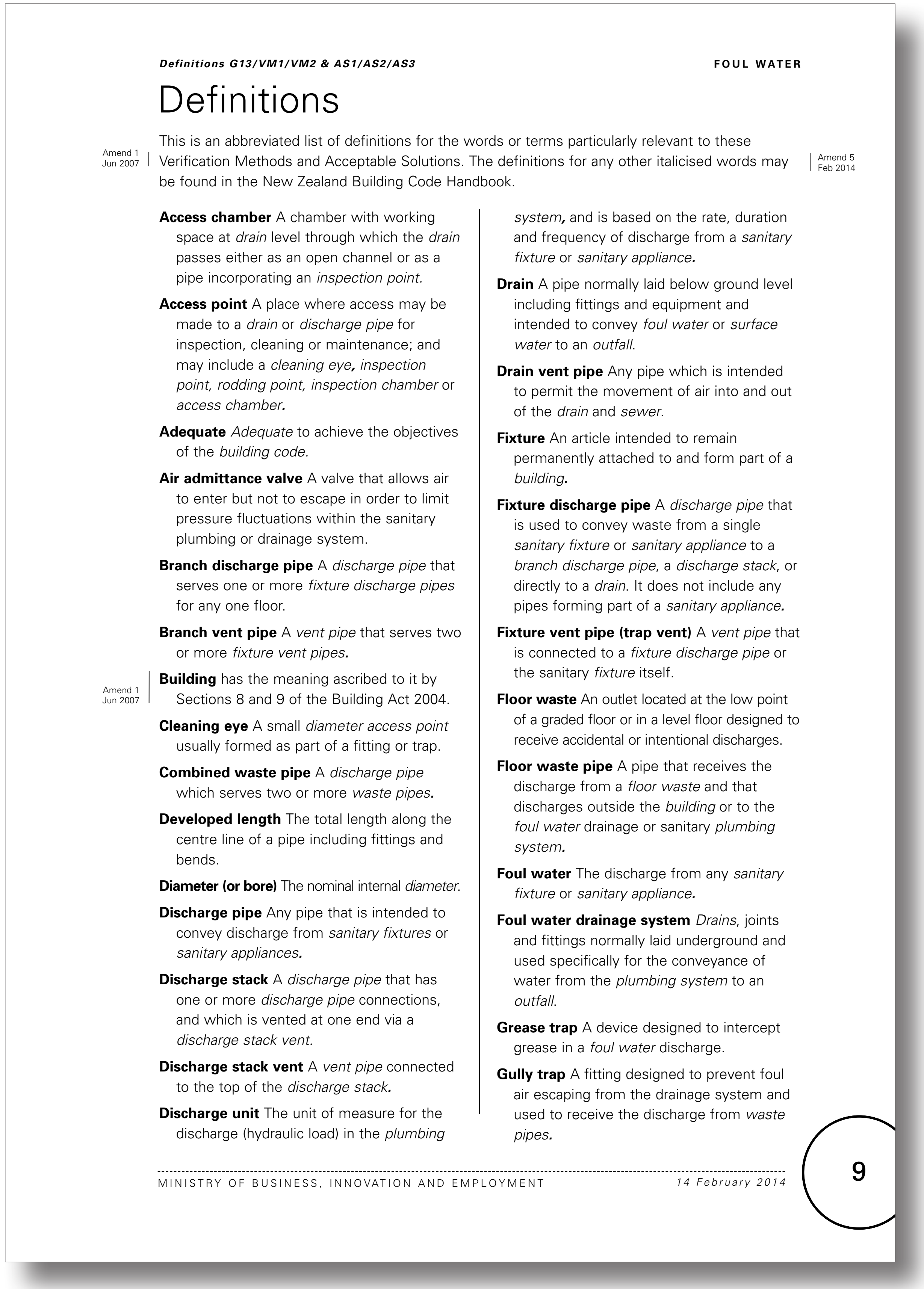

Definitions

Amend 1 Jun 2007

This is an abbreviated list of definitions for the words or terms particularly relevant to these Verification Methods and Acceptable Solutions. The definitions for any other italicised words may be found in the New Zealand Building Code Handbook.

Amend 5 Feb 2014

Access chamber A chamber with working space at *drain* level through which the *drain* passes either as an open channel or as a pipe incorporating an *inspection point.*

Access point A place where access may be made to a *drain* or *discharge pipe* for inspection, cleaning or maintenance; and may include a *cleaning eye, inspection point, rodding point, inspection chamber* or *access chamber.*

Adequate *Adequate* to achieve the objectives of the *building code.*

Air admittance valve A valve that allows air to enter but not to escape in order to limit pressure fluctuations within the sanitary plumbing or drainage system.

Branch discharge pipe A *discharge pipe* that serves one or more *fixture discharge pipes* for any one floor.

Branch vent pipe A *vent pipe* that serves two or more *fixture vent pipes.*

Amend 1 Jun 2007

Building has the meaning ascribed to it by Sections 8 and 9 of the Building Act 2004.

Cleaning eye A small *diameter access point* usually formed as part of a fitting or trap.

Combined waste pipe A *discharge pipe* which serves two or more *waste pipes.*

Developed length The total length along the centre line of a pipe including fittings and bends.

Diameter (or bore) The nominal internal *diameter.*

Discharge pipe Any pipe that is intended to convey discharge from *sanitary fixtures* or *sanitary appliances.*

Discharge stack A *discharge pipe* that has one or more *discharge pipe* connections, and which is vented at one end via a *discharge stack vent.*

Discharge stack vent A *vent pipe* connected to the top of the *discharge stack.*

Discharge unit The unit of measure for the discharge (hydraulic load) in the *plumbing system,* and is based on the rate, duration and frequency of discharge from a *sanitary fixture* or *sanitary appliance.*

Drain A pipe normally laid below ground level including fittings and equipment and intended to convey *foul water* or *surface water* to an *outfall.*

Drain vent pipe Any pipe which is intended to permit the movement of air into and out of the *drain* and *sewer.*

Fixture An article intended to remain permanently attached to and form part of a *building.*

Fixture discharge pipe A *discharge pipe* that is used to convey waste from a single *sanitary fixture* or *sanitary appliance* to a *branch discharge pipe*, a *discharge stack*, or directly to a *drain.* It does not include any pipes forming part of a *sanitary appliance.*

Fixture vent pipe (trap vent) A *vent pipe* that is connected to a *fixture discharge pipe* or the sanitary *fixture* itself.

Floor waste An outlet located at the low point of a graded floor or in a level floor designed to receive accidental or intentional discharges.

Floor waste pipe A pipe that receives the discharge from a *floor waste* and that discharges outside the *building* or to the *foul water* drainage or sanitary *plumbing system.*

Foul water The discharge from any *sanitary fixture* or *sanitary appliance.*

Foul water drainage system *Drains*, joints and fittings normally laid underground and used specifically for the conveyance of water from the *plumbing system* to an *outfall.*

Grease trap A device designed to intercept grease in a *foul water* discharge.

Gully trap A fitting designed to prevent foul air escaping from the drainage system and used to receive the discharge from *waste pipes.*

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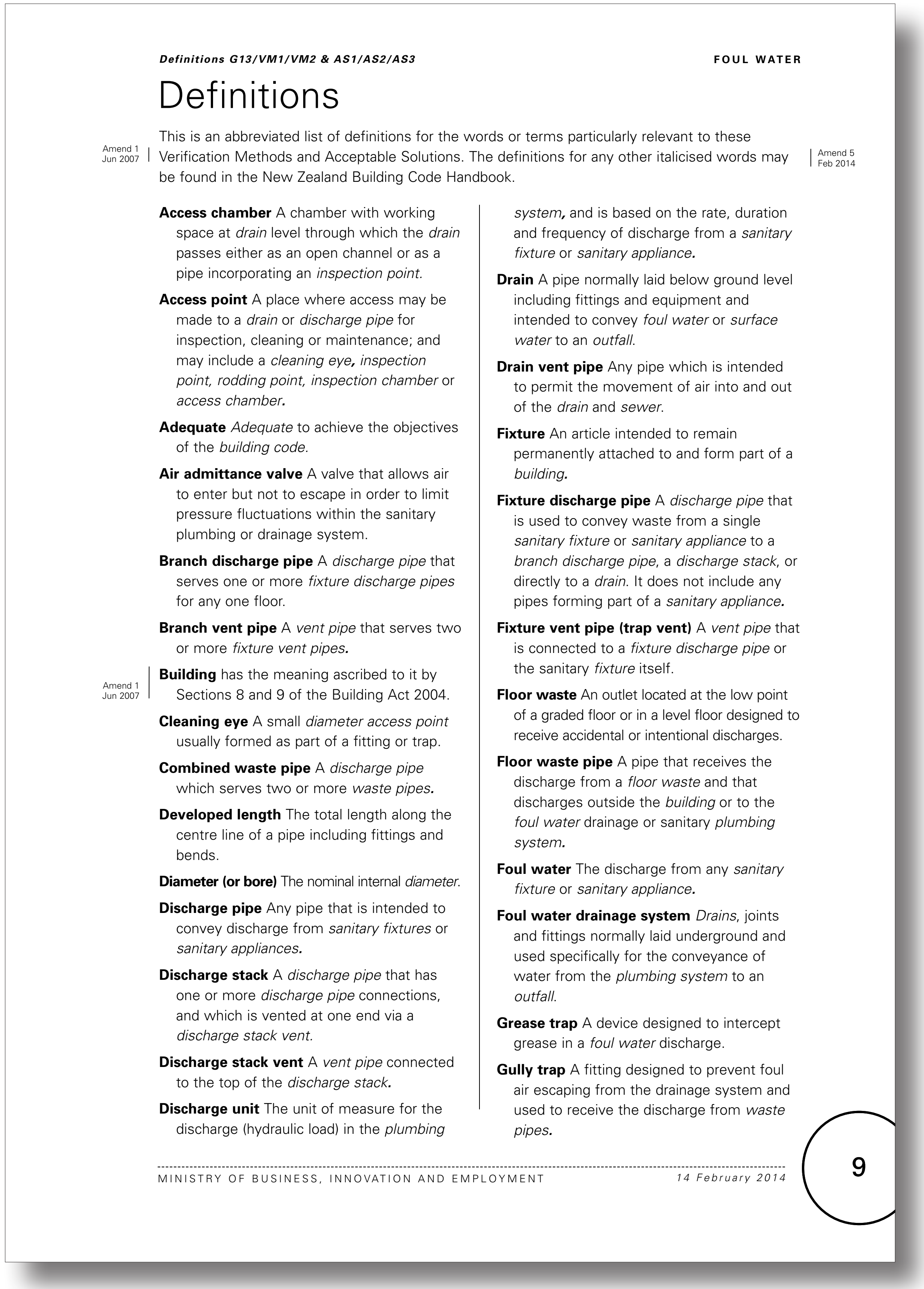

Definitions G13/VM1/VM2 & AS1/AS2/AS3 FOUL WATER

Definitions

Amend 1 Jun 2007

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Amend 5 Feb 2014

Access chamber A chamber with working space at *drain* level through which the *drain* passes either as an open channel or as a pipe incorporating an *inspection point.*

Access point A place where access may be made to a *drain* or *discharge pipe* for inspection, cleaning or maintenance; and may include a *cleaning eye, inspection point, rodding point, inspection chamber* or *access chamber.*

Adequate *Adequate* to achieve the objectives of the *building code.*

Air admittance valve A valve that allows air to enter but not to escape in order to limit pressure fluctuations within the sanitary plumbing or drainage system.

Branch discharge pipe A *discharge pipe* that serves one or more *fixture discharge pipes* for any one floor.

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Cleaning eye A small *diameter access point* usually formed as part of a fitting or trap.

Combined waste pipe A *discharge pipe* which serves two or more *waste pipes.*

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Discharge pipe Any pipe that is intended to convey discharge from *sanitary fixtures* or *sanitary appliances.*

Discharge stack A *discharge pipe* that has one or more *discharge pipe* connections, and which is vented at one end via a *discharge stack vent.*

Discharge stack vent A *vent pipe* connected to the top of the *discharge stack.*

Discharge unit The unit of measure for the discharge (hydraulic load) in the *plumbing system,* and is based on the rate, duration and frequency of discharge from a *sanitary fixture* or *sanitary appliance.*

Drain A pipe normally laid below ground level including fittings and equipment and intended to convey *foul water* or *surface water* to an *outfall.*

Drain vent pipe Any pipe which is intended to permit the movement of air into and out of the *drain* and *sewer.*

Fixture An article intended to remain permanently attached to and form part of a *building.*

Fixture discharge pipe A *discharge pipe* that is used to convey waste from a single *sanitary fixture* or *sanitary appliance* to a *branch discharge pipe*, a *discharge stack*, or directly to a *drain.* It does not include any pipes forming part of a *sanitary appliance.*

Fixture vent pipe (trap vent) A *vent pipe* that is connected to a *fixture discharge pipe* or the sanitary *fixture* itself.

Floor waste An outlet located at the low point of a graded floor or in a level floor designed to receive accidental or intentional discharges.

Floor waste pipe A pipe that receives the discharge from a *floor waste* and that discharges outside the *building* or to the *foul water* drainage or sanitary *plumbing system.*

Foul water The discharge from any *sanitary fixture* or *sanitary appliance.*

Foul water drainage system *Drains*, joints and fittings normally laid underground and used specifically for the conveyance of water from the *plumbing system* to an *outfall.*

Grease trap A device designed to intercept grease in a *foul water* discharge.

Gully trap A fitting designed to prevent foul air escaping from the drainage system and used to receive the discharge from *waste pipes.*

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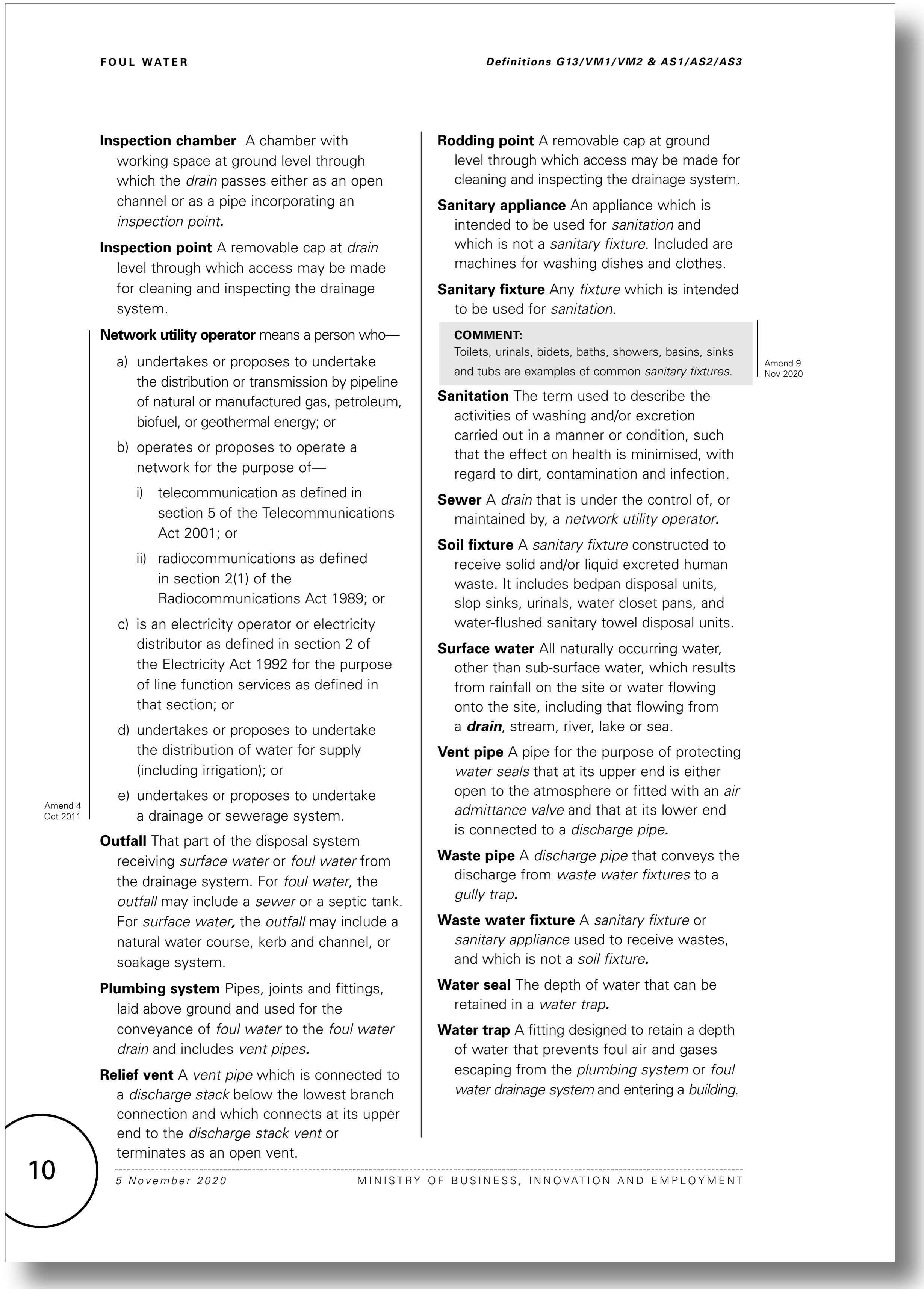
Current G13 Foul Water - No changes proposed to this page



FOUL WATER

Definitions G13/VM1/VM2 & AS1/AS2/AS3

Inspection chamber A chamber with working space at ground level through which the *drain* passes either as an open channel or as a pipe incorporating an *inspection point*.

Inspection point A removable cap at *drain* level through which access may be made for cleaning and inspecting the drainage system.

Network utility operator means a person who—

- a) undertakes or proposes to undertake the distribution or transmission by pipeline of natural or manufactured gas, petroleum, biofuel, or geothermal energy; or
- b) operates or proposes to operate a network for the purpose of—
  - i) telecommunication as defined in section 5 of the Telecommunications Act 2001; or
  - ii) radiocommunications as defined in section 2(1) of the Radiocommunications Act 1989; or
- c) is an electricity operator or electricity distributor as defined in section 2 of the Electricity Act 1992 for the purpose of line function services as defined in that section; or
- d) undertakes or proposes to undertake the distribution of water for supply (including irrigation); or
- e) undertakes or proposes to undertake a drainage or sewerage system.

Amend 4 Oct 2011

Outfall That part of the disposal system receiving *surface water* or *foul water* from the drainage system. For *foul water*, the *outfall* may include a *sewer* or a septic tank. For *surface water*, the *outfall* may include a natural water course, kerb and channel, or soakage system.

Plumbing system Pipes, joints and fittings, laid above ground and used for the conveyance of *foul water* to the *foul water drain* and includes *vent pipes*.

Relief vent A *vent pipe* which is connected to a *discharge stack* below the lowest branch connection and which connects at its upper end to the *discharge stack vent* or terminates as an open vent.

Rodding point A removable cap at ground level through which access may be made for cleaning and inspecting the drainage system.

Sanitary appliance An appliance which is intended to be used for *sanitation* and which is not a *sanitary fixture*. Included are machines for washing dishes and clothes.

Sanitary fixture Any *fixture* which is intended to be used for *sanitation*.

COMMENT:
Toilets, urinals, bidets, baths, showers, basins, sinks and tubs are examples of common *sanitary fixtures*.

Amend 9 Nov 2020

Sanitation The term used to describe the activities of washing and/or excretion carried out in a manner or condition, such that the effect on health is minimised, with regard to dirt, contamination and infection.

Sewer A *drain* that is under the control of, or maintained by, a *network utility operator*.

Soil fixture A *sanitary fixture* constructed to receive solid and/or liquid excreted human waste. It includes bedpan disposal units, slop sinks, urinals, water closet pans, and water-flushed sanitary towel disposal units.

Surface water All naturally occurring water, other than sub-surface water, which results from rainfall on the site or water flowing onto the site, including that flowing from a ***drain***, stream, river, lake or sea.

Vent pipe A pipe for the purpose of protecting *water seals* that at its upper end is either open to the atmosphere or fitted with an *air admittance valve* and that at its lower end is connected to a *discharge pipe*.

Waste pipe A *discharge pipe* that conveys the discharge from *waste water fixtures* to a *gully trap*.

Waste water fixture A *sanitary fixture* or *sanitary appliance* used to receive wastes, and which is not a *soil fixture*.

Water seal The depth of water that can be retained in a *water trap*.

Water trap A fitting designed to retain a depth of water that prevents foul air and gases escaping from the *plumbing system* or *foul water drainage system* and entering a *building*.

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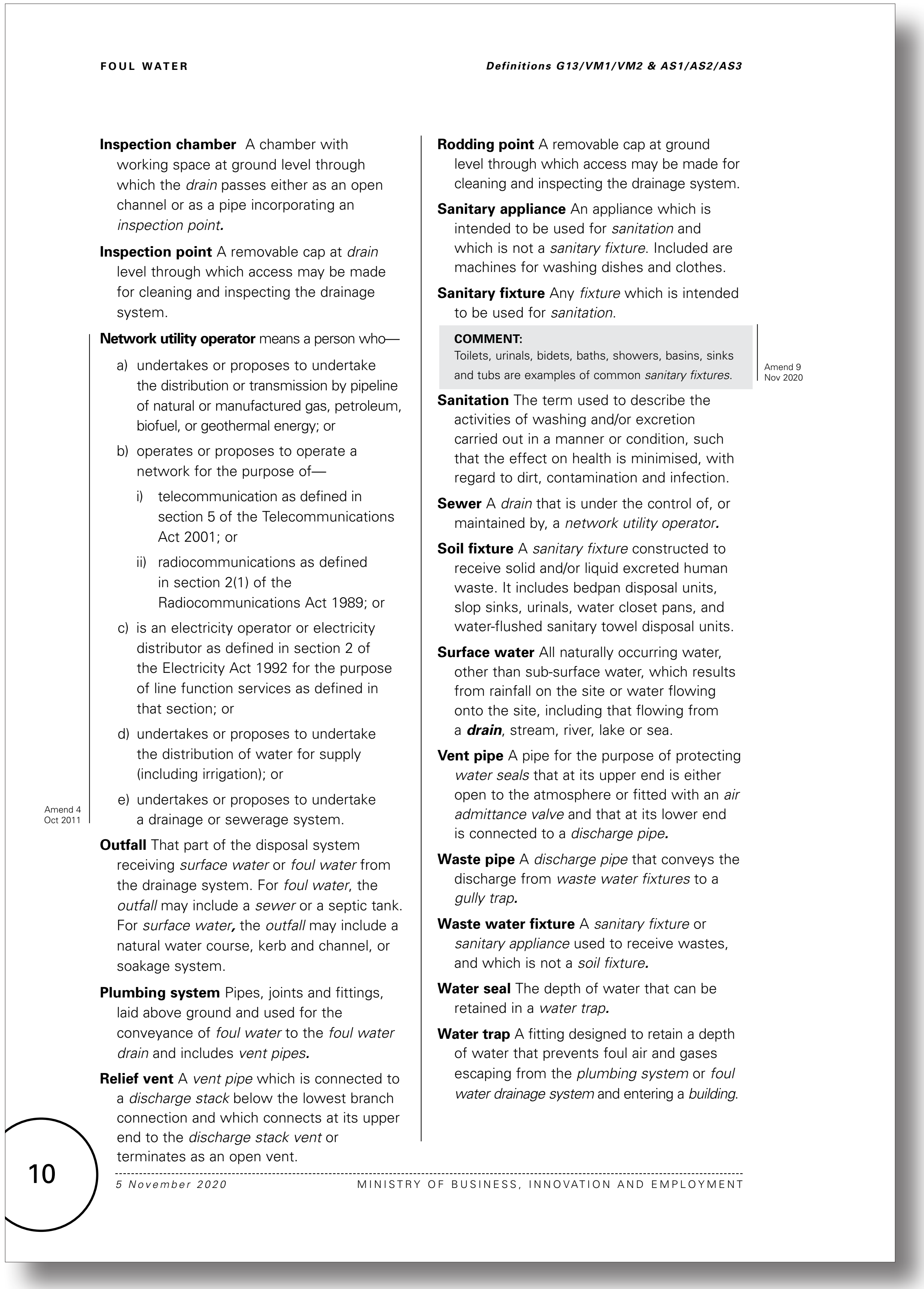
5 November 2020 MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Proposed G13 Foul Water - No changes proposed to this page



FOUL WATER

Definitions G13/VM1/VM2 & AS1/AS2/AS3

Inspection chamber A chamber with working space at ground level through which the *drain* passes either as an open channel or as a pipe incorporating an *inspection point*.

Inspection point A removable cap at *drain* level through which access may be made for cleaning and inspecting the drainage system.

Network utility operator means a person who—

- a) undertakes or proposes to undertake the distribution or transmission by pipeline of natural or manufactured gas, petroleum, biofuel, or geothermal energy; or
- b) operates or proposes to operate a network for the purpose of—
  - i) telecommunication as defined in section 5 of the Telecommunications Act 2001; or
  - ii) radiocommunications as defined in section 2(1) of the Radiocommunications Act 1989; or
- c) is an electricity operator or electricity distributor as defined in section 2 of the Electricity Act 1992 for the purpose of line function services as defined in that section; or
- d) undertakes or proposes to undertake the distribution of water for supply (including irrigation); or
- e) undertakes or proposes to undertake a drainage or sewerage system.

Amend 4 Oct 2011

Outfall That part of the disposal system receiving *surface water* or *foul water* from the drainage system. For *foul water*, the *outfall* may include a *sewer* or a septic tank. For *surface water*, the *outfall* may include a natural water course, kerb and channel, or soakage system.

Plumbing system Pipes, joints and fittings, laid above ground and used for the conveyance of *foul water* to the *foul water drain* and includes *vent pipes*.

Relief vent A *vent pipe* which is connected to a *discharge stack* below the lowest branch connection and which connects at its upper end to the *discharge stack vent* or terminates as an open vent.

Rodding point A removable cap at ground level through which access may be made for cleaning and inspecting the drainage system.

Sanitary appliance An appliance which is intended to be used for *sanitation* and which is not a *sanitary fixture*. Included are machines for washing dishes and clothes.

Sanitary fixture Any *fixture* which is intended to be used for *sanitation*.

COMMENT:
Toilets, urinals, bidets, baths, showers, basins, sinks and tubs are examples of common *sanitary fixtures*.

Amend 9 Nov 2020

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Water trap A fitting designed to retain a depth of water that prevents foul air and gases escaping from the *plumbing system* or *foul water drainage system* and entering a *building*.

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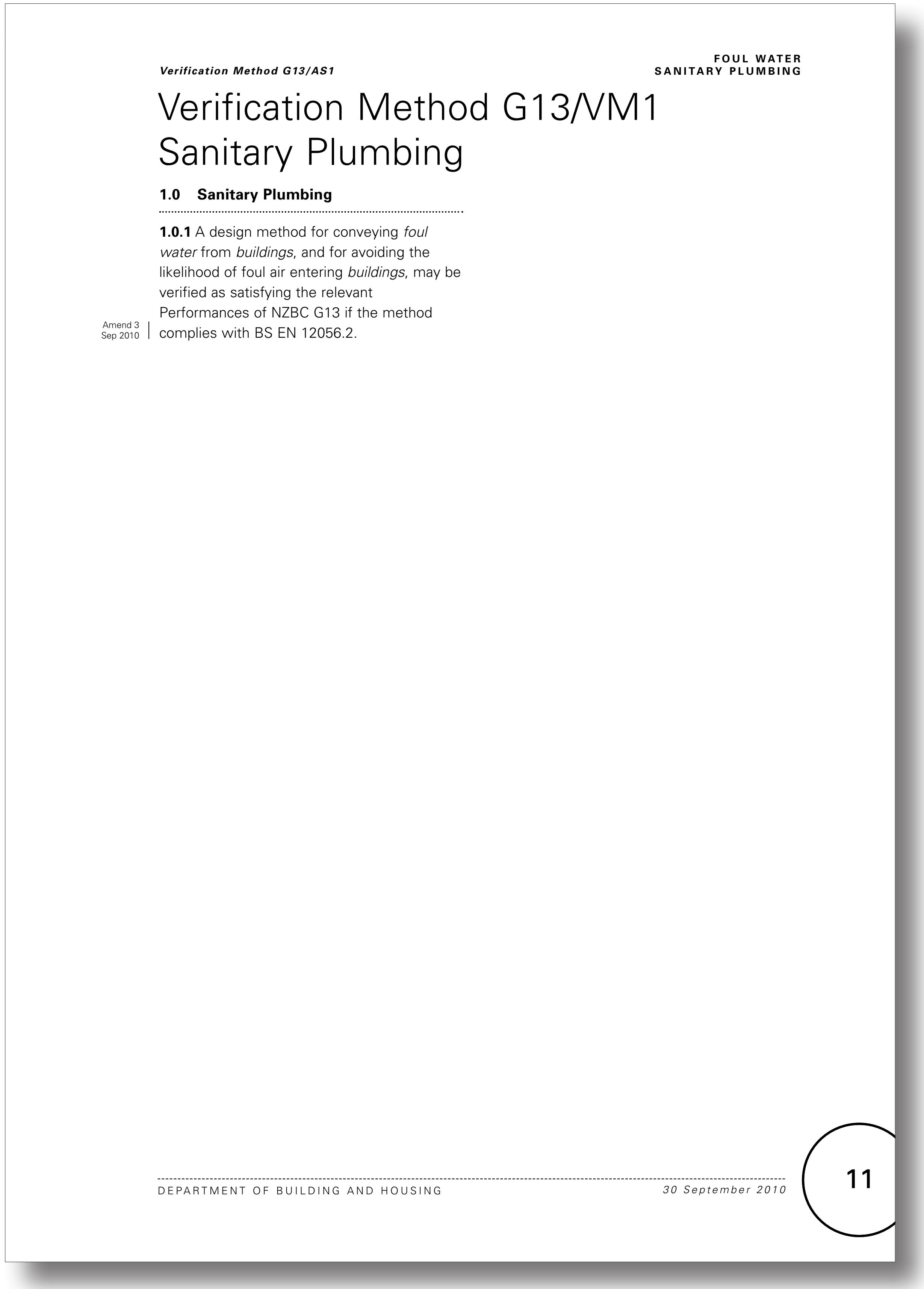
5 November 2020 MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Current G13 Foul Water - No changes proposed to this page



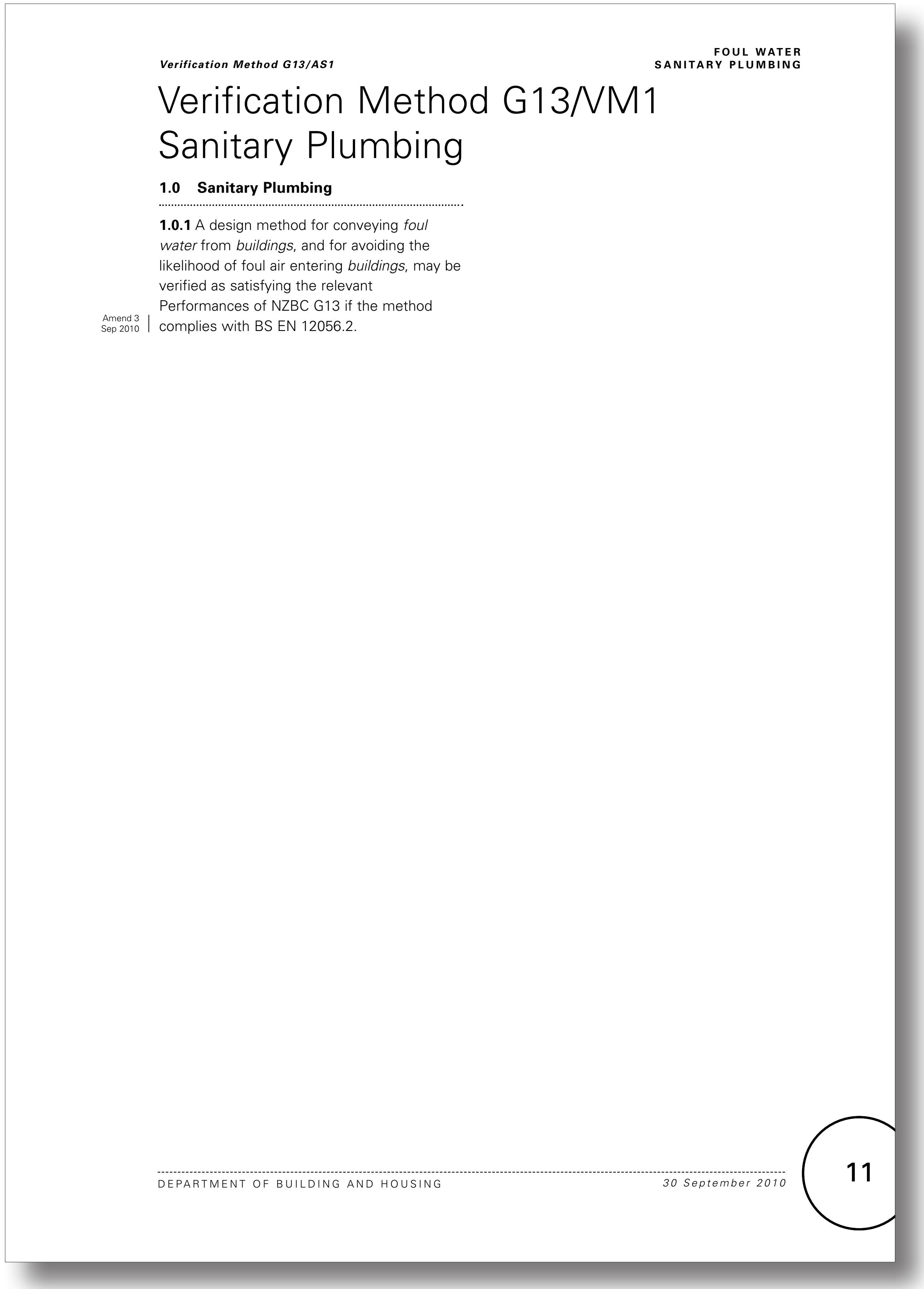
Verification Method G13/VM1 Sanitary Plumbing

1.0 Sanitary Plumbing

1.0.1 A design method for conveying *foul water* from *buildings*, and for avoiding the likelihood of foul air entering *buildings*, may be verified as satisfying the relevant Performances of NZBC G13 if the method complies with BS EN 12056.2.

Amend 3
Sep 2010

Proposed G13 Foul Water - No changes proposed to this page



Verification Method G13/VM1 Sanitary Plumbing

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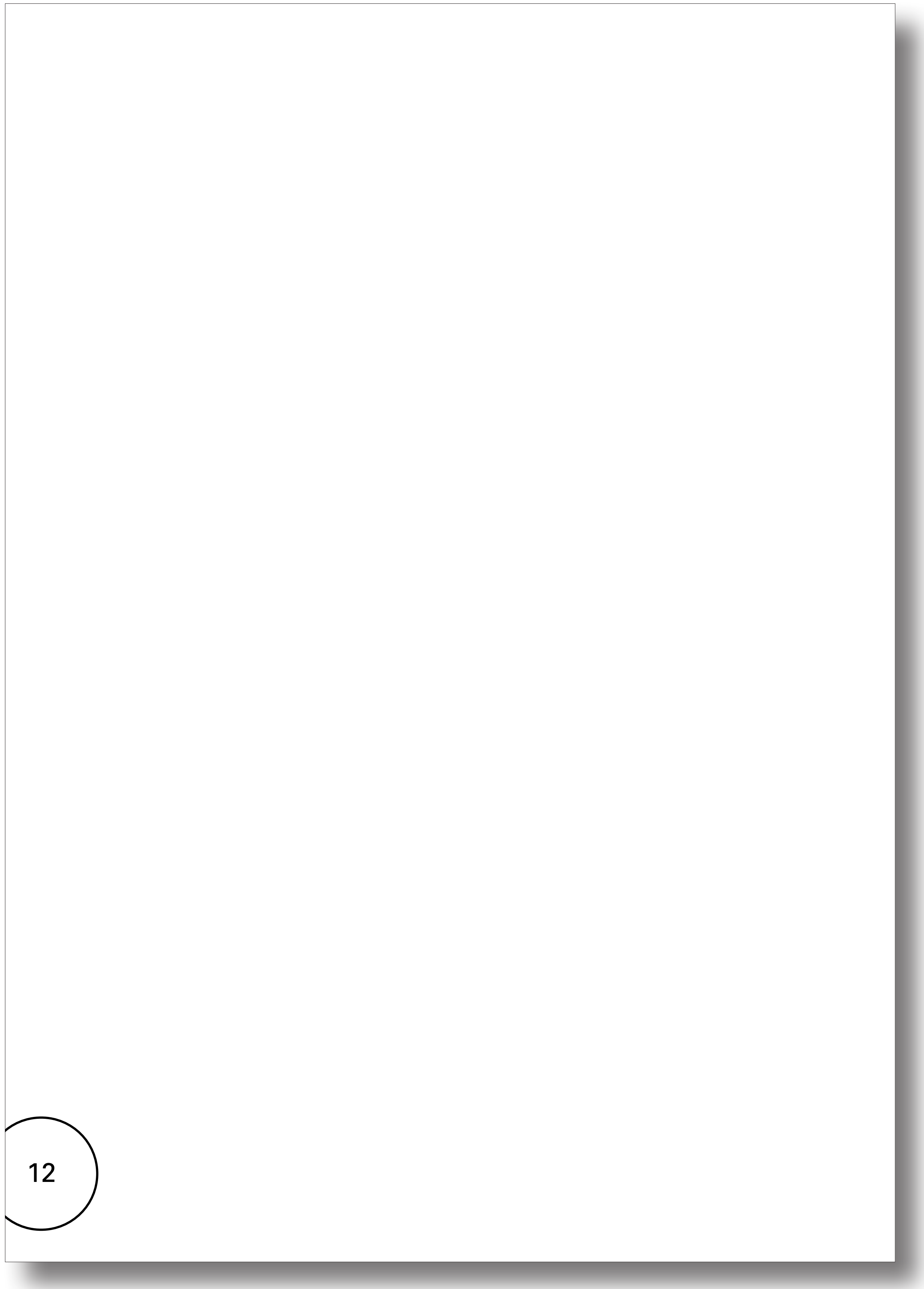
Amend 3
Sep 2010

Current G13 Foul Water - No changes proposed to this page



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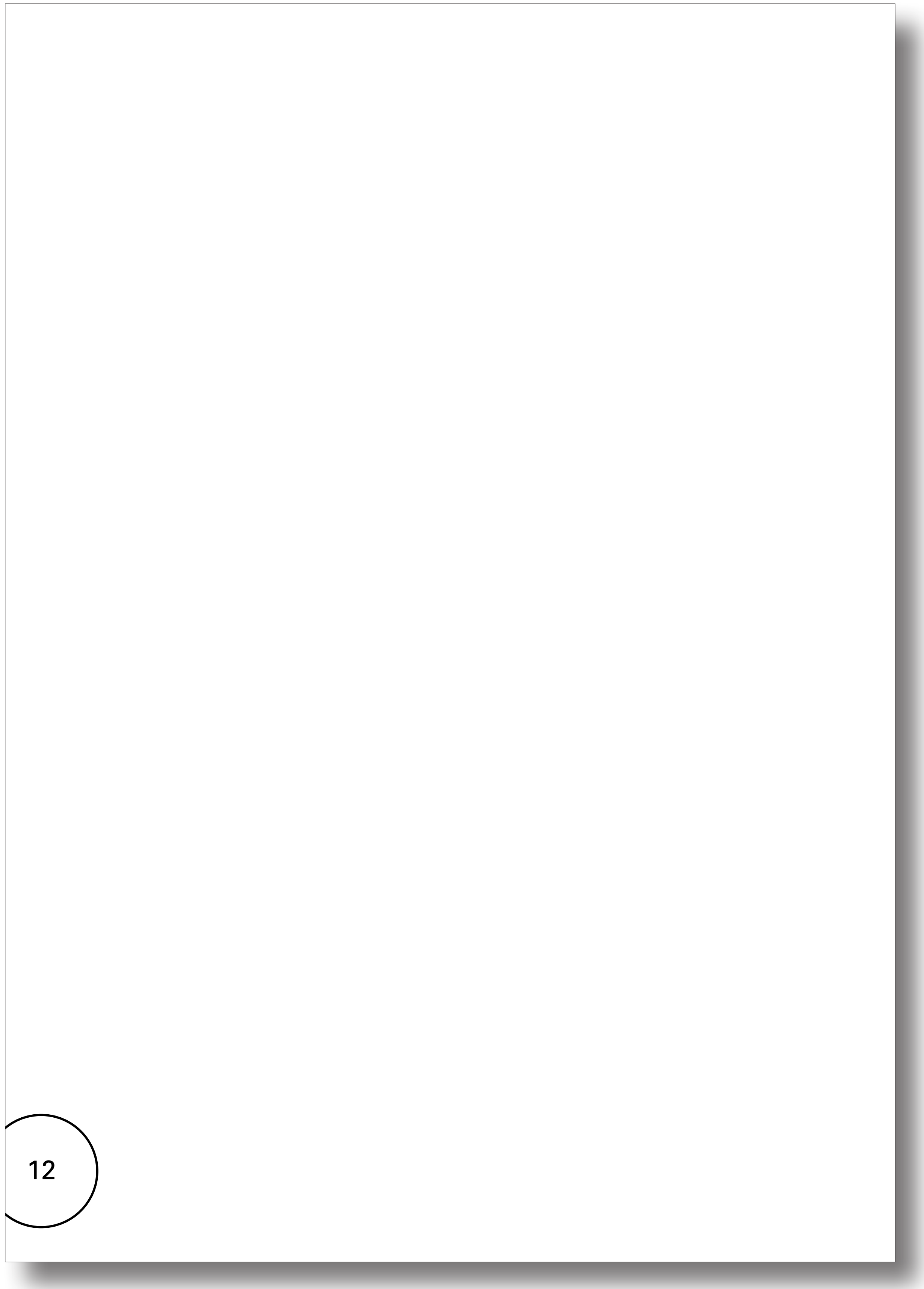
Proposed G13 Foul Water - No changes proposed to this page



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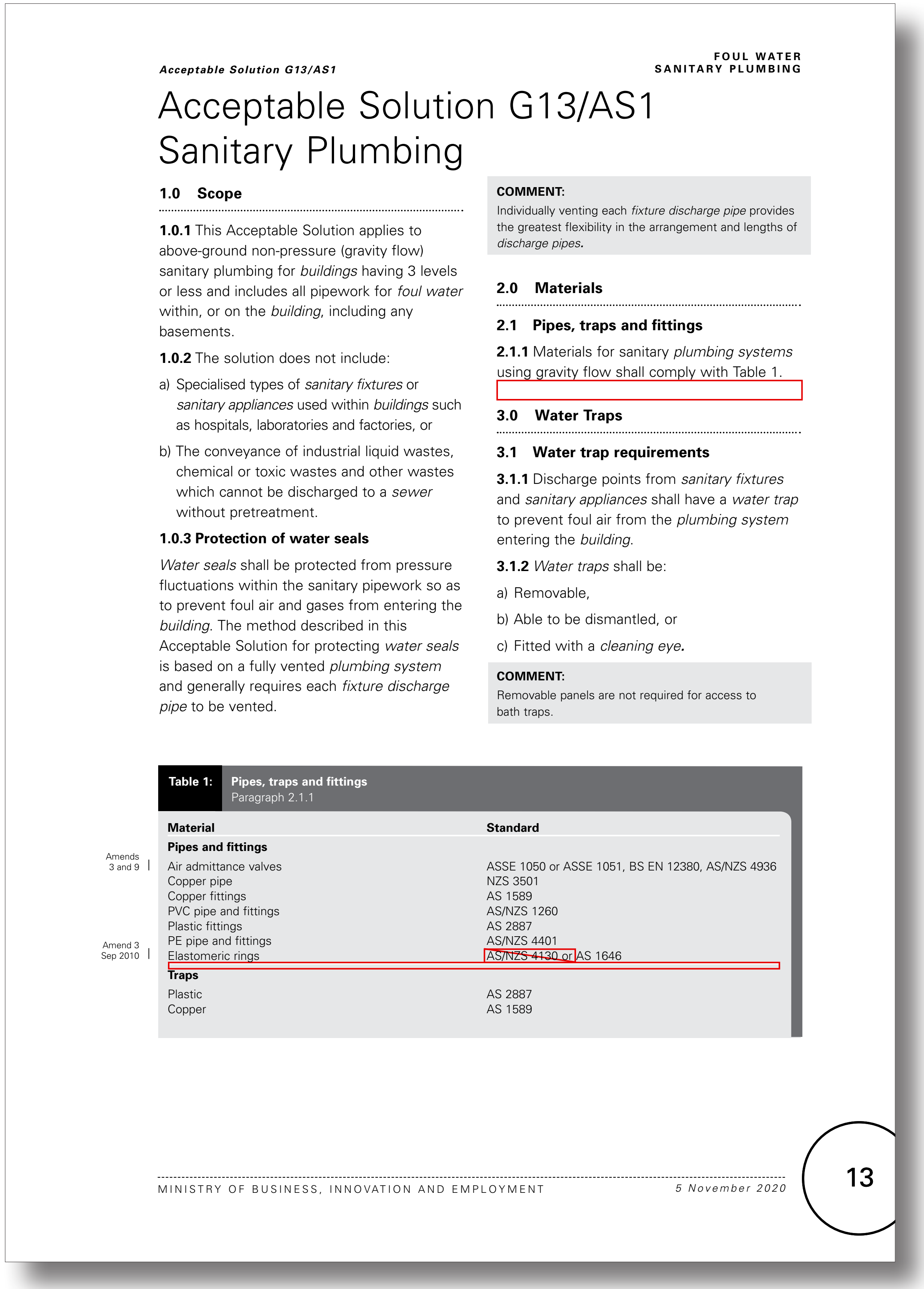
Appendix C. Proposed changes to the acceptable solutions and verification methods for clause G13 Foul Water

Current G13 Foul Water acceptable solutions and verification methods

(Text to be amended shown in red)



Acceptable Solution G13/AS1

FOUL WATER
SANITARY PLUMBING

Acceptable Solution G13/AS1
Sanitary Plumbing

1.0 Scope

1.0.1 This Acceptable Solution applies to above-ground non-pressure (gravity flow) sanitary plumbing for *buildings* having 3 levels or less and includes all pipework for *foul water* within, or on the *building*, including any basements.

1.0.2 The solution does not include:

a) Specialised types of *sanitary fixtures* or *sanitary appliances* used within *buildings* such as hospitals, laboratories and factories, or

b) The conveyance of industrial liquid wastes, chemical or toxic wastes and other wastes which cannot be discharged to a *sewer* without pretreatment.

1.0.3 Protection of water seals

Water seals shall be protected from pressure fluctuations within the sanitary pipework so as to prevent foul air and gases from entering the *building*. The method described in this Acceptable Solution for protecting *water seals* is based on a fully vented *plumbing system* and generally requires each *fixture discharge pipe* to be vented.

COMMENT:

Individually venting each *fixture discharge pipe* provides the greatest flexibility in the arrangement and lengths of *discharge pipes*.

2.0 Materials

2.1 Pipes, traps and fittings

2.1.1 Materials for sanitary *plumbing systems* using gravity flow shall comply with Table 1.

3.0 Water Traps

3.1 Water trap requirements

3.1.1 Discharge points from *sanitary fixtures* and *sanitary appliances* shall have a *water trap* to prevent foul air from the *plumbing system* entering the *building*.

3.1.2 *Water traps* shall be:

a) Removable,

b) Able to be dismantled, or

c) Fitted with a *cleaning eye*.

COMMENT:

Removable panels are not required for access to bath traps.

Table 1: Pipes, traps and fittings
Paragraph 2.1.1

Material	Standard
Pipes and fittings	
Air admittance valves	ASSE 1050 or ASSE 1051, BS EN 12380, AS/NZS 4936
Copper pipe	NZS 3501
Copper fittings	AS 1589
PVC pipe and fittings	AS/NZS 1260
Plastic fittings	AS 2887
PE pipe and fittings	AS/NZS 4401
Elastomeric rings	~~AS/NZS 4130 or~~ AS 1646
Traps	
Plastic	AS 2887
Copper	AS 1589

Amends 3 and 9

Amend 3 Sep 2010

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT *5 November 2020*

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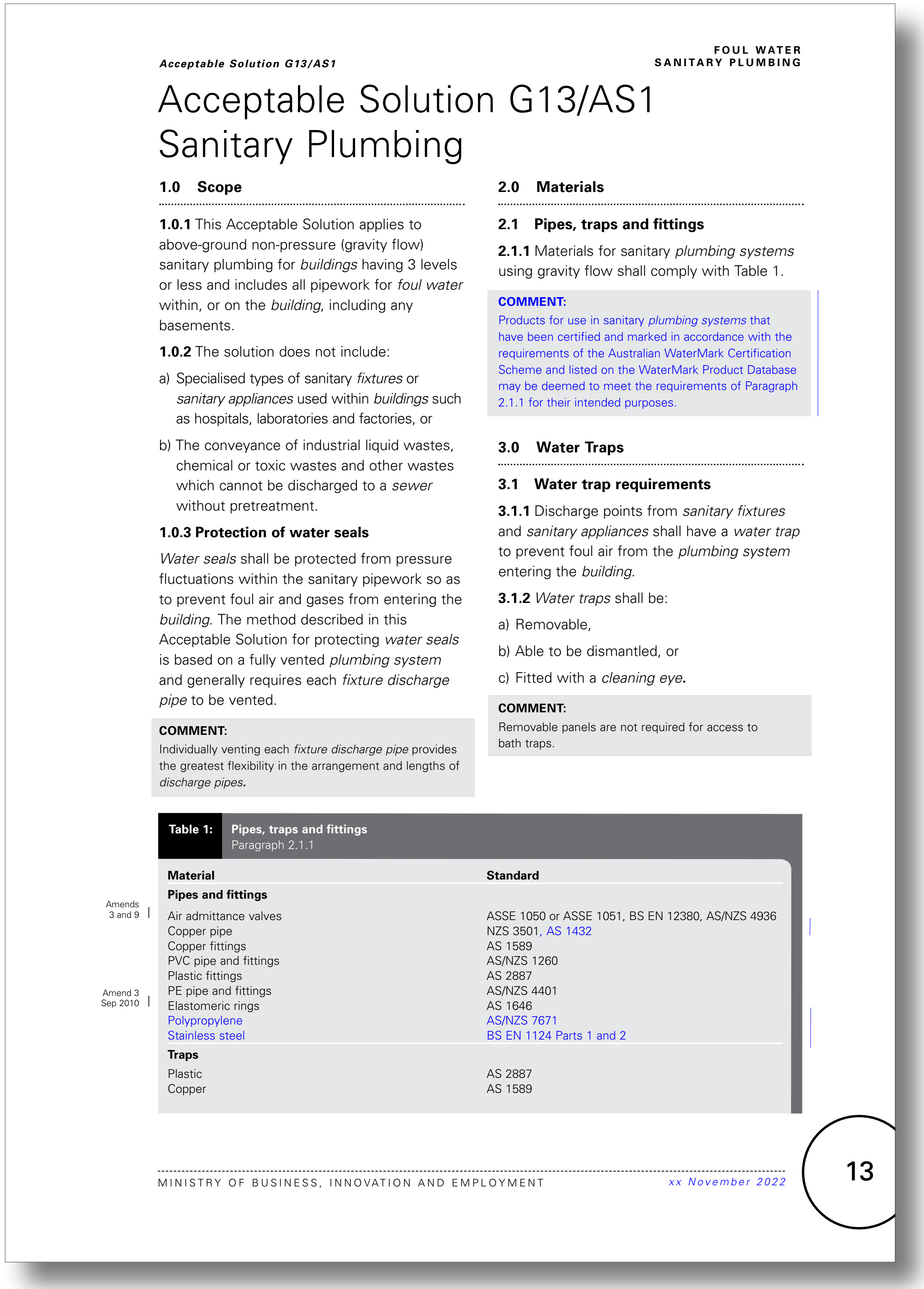
Proposed amendments to G13 Foul Water acceptable solutions and verification methods (Proposed text in blue)



Acceptable Solution G13/AS1

FOUL WATER
SANITARY PLUMBING

Acceptable Solution G13/AS1
Sanitary Plumbing

1.0 Scope

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a) Specialised types of sanitary *fixtures* or *sanitary appliances* used within *buildings* such as hospitals, laboratories and factories, or

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COMMENT:

Individually venting each *fixture discharge pipe* provides the greatest flexibility in the arrangement and lengths of *discharge pipes.*

2.0 Materials

2.1 Pipes, traps and fittings

2.1.1 Materials for sanitary *plumbing systems* using gravity flow shall comply with Table 1.

COMMENT:

Products for use in sanitary *plumbing systems* that have been certified and marked in accordance with the requirements of the Australian WaterMark Certification Scheme and listed on the WaterMark Product Database may be deemed to meet the requirements of Paragraph 2.1.1 for their intended purposes.

3.0 Water Traps

3.1 Water trap requirements

3.1.1 Discharge points from *sanitary fixtures* and *sanitary appliances* shall have a *water trap* to prevent foul air from the *plumbing system* entering the *building*.

3.1.2 *Water traps* shall be:

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Copper fittings	AS 1589
PVC pipe and fittings	AS/NZS 1260
Plastic fittings	AS 2887
PE pipe and fittings	AS/NZS 4401
Elastomeric rings	AS 1646
Polypropylene	AS/NZS 7671
Stainless steel	BS EN 1124 Parts 1 and 2
Traps	
Plastic	AS 2887
Copper	AS 1589

Amends 3 and 9

Amend 3 Sep 2010

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT *xx November 2022*

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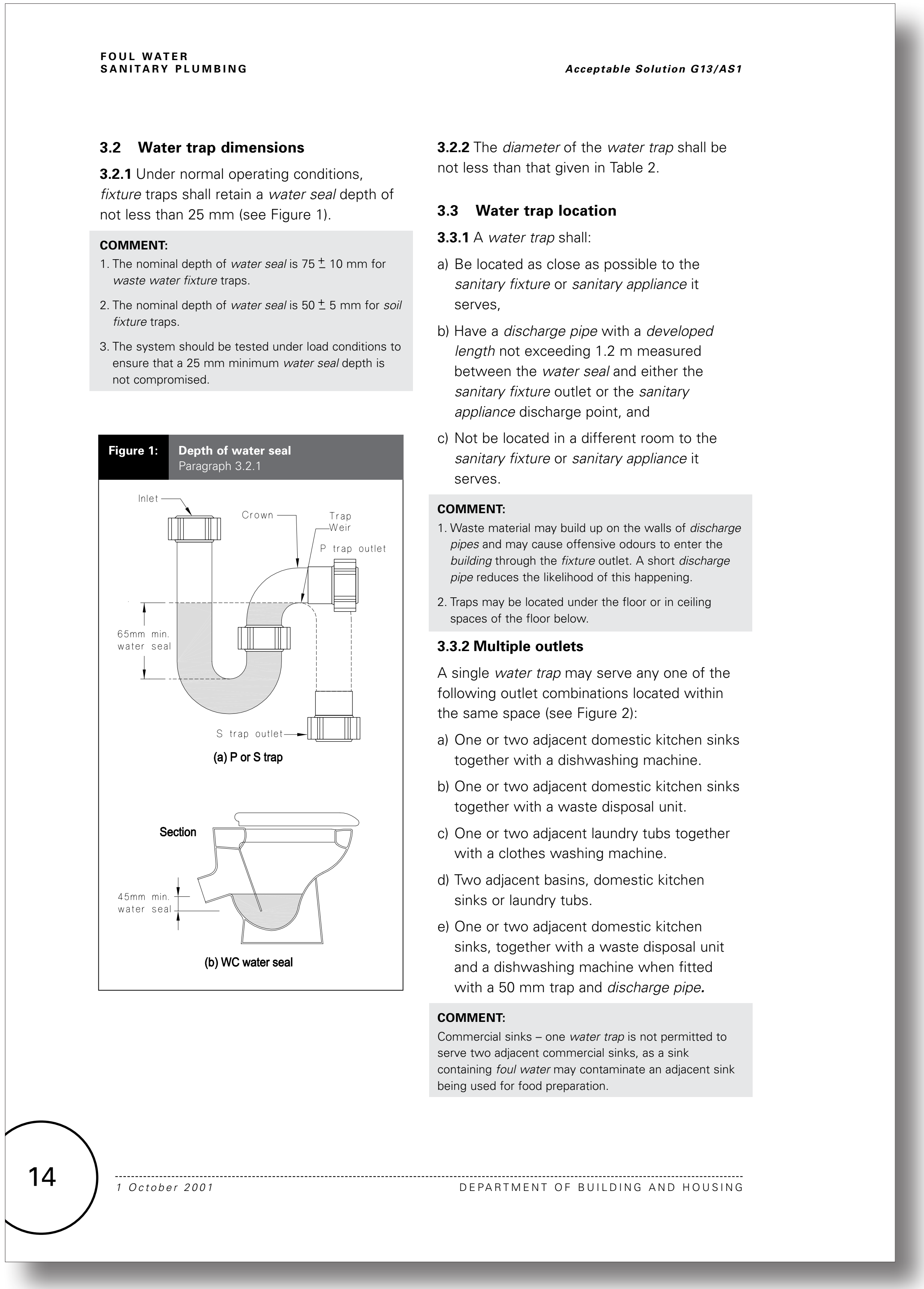
Current G13 Foul Water - No changes proposed to this page



3.2 Water trap dimensions

3.2.1 Under normal operating conditions, *fixture* traps shall retain a *water seal* depth of not less than 25 mm (see Figure 1).

COMMENT:

1. The nominal depth of *water seal* is 75 ± 10 mm for *waste water fixture* traps.
2. The nominal depth of *water seal* is 50 ± 5 mm for *soil fixture* traps.
3. The system should be tested under load conditions to ensure that a 25 mm minimum *water seal* depth is not compromised.

Figure 1: **Depth of water seal**
Paragraph 3.2.1

3.2.2 The *diameter* of the *water trap* shall be not less than that given in Table 2.

3.3 Water trap location

3.3.1 A *water trap* shall:

a) Be located as close as possible to the *sanitary fixture* or *sanitary appliance* it serves,

b) Have a *discharge pipe* with a *developed length* not exceeding 1.2 m measured between the *water seal* and either the *sanitary fixture* outlet or the *sanitary appliance* discharge point, and

c) Not be located in a different room to the *sanitary fixture* or *sanitary appliance* it serves.

COMMENT:

1. Waste material may build up on the walls of *discharge pipes* and may cause offensive odours to enter the *building* through the *fixture* outlet. A short *discharge pipe* reduces the likelihood of this happening.
2. Traps may be located under the floor or in ceiling spaces of the floor below.

3.3.2 Multiple outlets

A single *water trap* may serve any one of the following outlet combinations located within the same space (see Figure 2):

a) One or two adjacent domestic kitchen sinks together with a dishwashing machine.

b) One or two adjacent domestic kitchen sinks together with a waste disposal unit.

c) One or two adjacent laundry tubs together with a clothes washing machine.

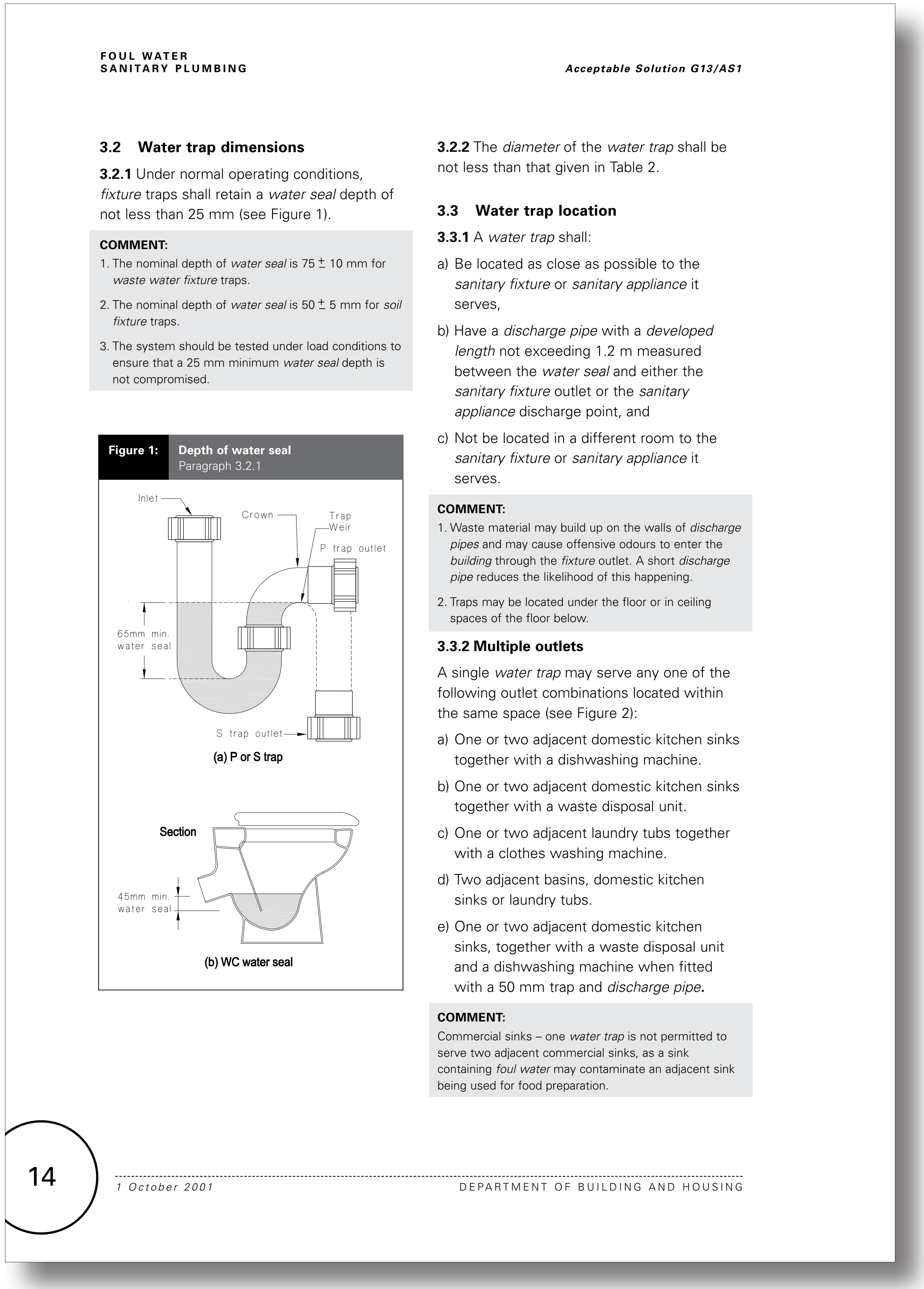
d) Two adjacent basins, domestic kitchen sinks or laundry tubs.

e) One or two adjacent domestic kitchen sinks, together with a waste disposal unit and a dishwashing machine when fitted with a 50 mm trap and *discharge pipe.*

COMMENT:

Commercial sinks – one *water trap* is not permitted to serve two adjacent commercial sinks, as a sink containing *foul water* may contaminate an adjacent sink being used for food preparation.

Proposed G13 Foul Water - No changes proposed to this page



FOUL WATER
SANITARY PLUMBING
Acceptable Solution G13/AS1

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c) Not be located in a different room to the *sanitary fixture* or *sanitary appliance* it serves.

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b) One or two adjacent domestic kitchen sinks together with a waste disposal unit.

c) One or two adjacent laundry tubs together with a clothes washing machine.

d) Two adjacent basins, domestic kitchen sinks or laundry tubs.

e) One or two adjacent domestic kitchen sinks, together with a waste disposal unit and a dishwashing machine when fitted with a 50 mm trap and *discharge pipe.*

COMMENT:

Commercial sinks – one *water trap* is not permitted to serve two adjacent commercial sinks, as a sink containing *foul water* may contaminate an adjacent sink being used for food preparation.

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1 October 2001
DEPARTMENT OF BUILDING AND HOUSING

Current G13 Foul Water - No changes proposed to this page

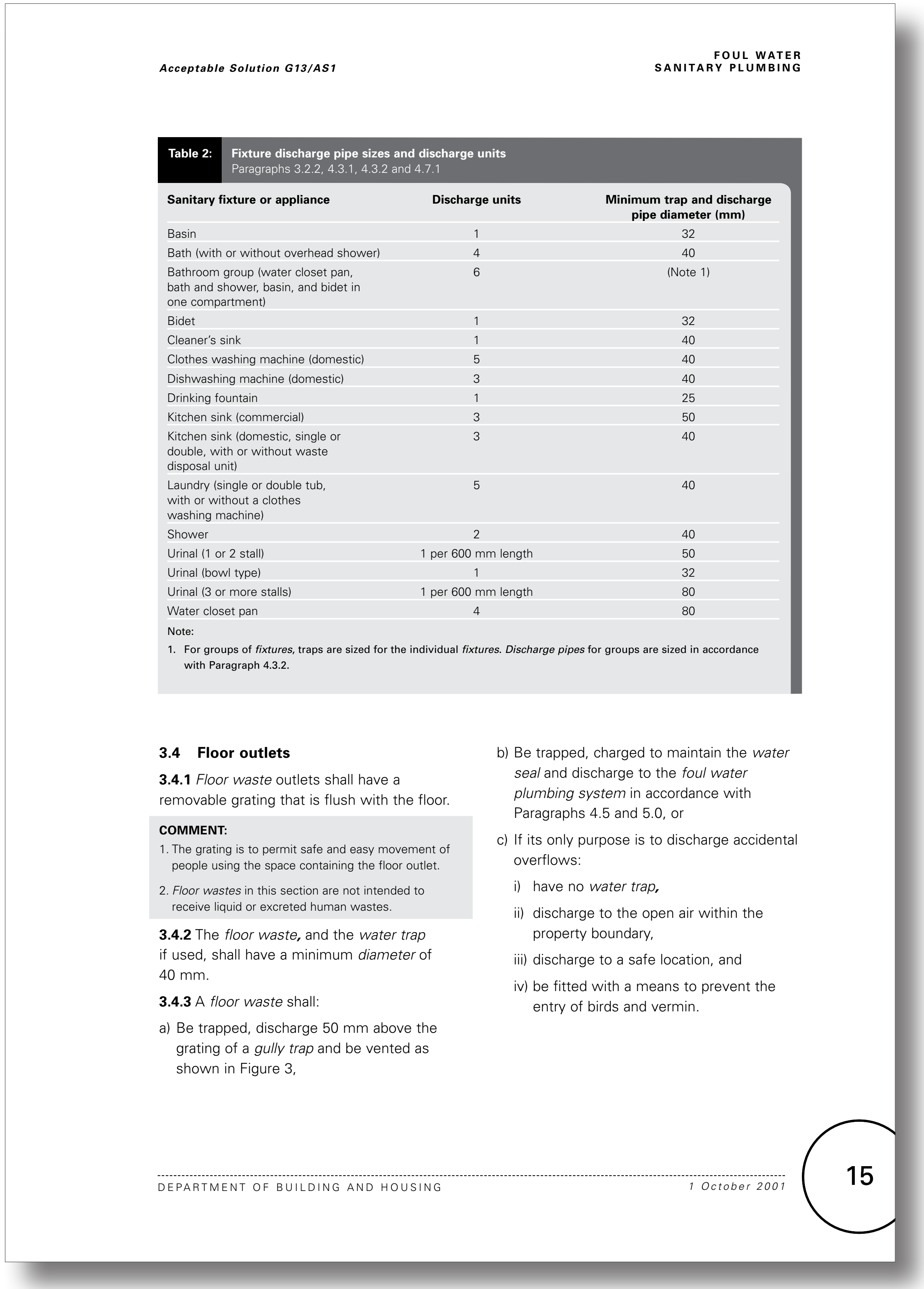


Table 2: Fixture discharge pipe sizes and discharge units
Paragraphs 3.2.2, 4.3.1, 4.3.2 and 4.7.1

Sanitary fixture or appliance	Discharge units	Minimum trap and discharge pipe diameter (mm)
Basin	1	32
Bath (with or without overhead shower)	4	40
Bathroom group (water closet pan, bath and shower, basin, and bidet in one compartment)	6	(Note 1)
Bidet	1	32
Cleaner's sink	1	40
Clothes washing machine (domestic)	5	40
Dishwashing machine (domestic)	3	40
Drinking fountain	1	25
Kitchen sink (commercial)	3	50
Kitchen sink (domestic, single or double, with or without waste disposal unit)	3	40
Laundry (single or double tub, with or without a clothes washing machine)	5	40
Shower	2	40
Urinal (1 or 2 stall)	1 per 600 mm length	50
Urinal (bowl type)	1	32
Urinal (3 or more stalls)	1 per 600 mm length	80
Water closet pan	4	80

Note:

1. For groups of *fixtures*, traps are sized for the individual *fixtures. Discharge pipes* for groups are sized in accordance with Paragraph 4.3.2.

3.4 Floor outlets

3.4.1 *Floor waste* outlets shall have a removable grating that is flush with the floor.

COMMENT:

1. The grating is to permit safe and easy movement of people using the space containing the floor outlet.
2. *Floor wastes* in this section are not intended to receive liquid or excreted human wastes.

3.4.2 The *floor waste,* and the *water trap* if used, shall have a minimum *diameter* of 40 mm.

3.4.3 A *floor waste* shall:

a) Be trapped, discharge 50 mm above the grating of a *gully trap* and be vented as shown in Figure 3,

b) Be trapped, charged to maintain the *water seal* and discharge to the *foul water plumbing system* in accordance with Paragraphs 4.5 and 5.0, or

c) If its only purpose is to discharge accidental overflows:

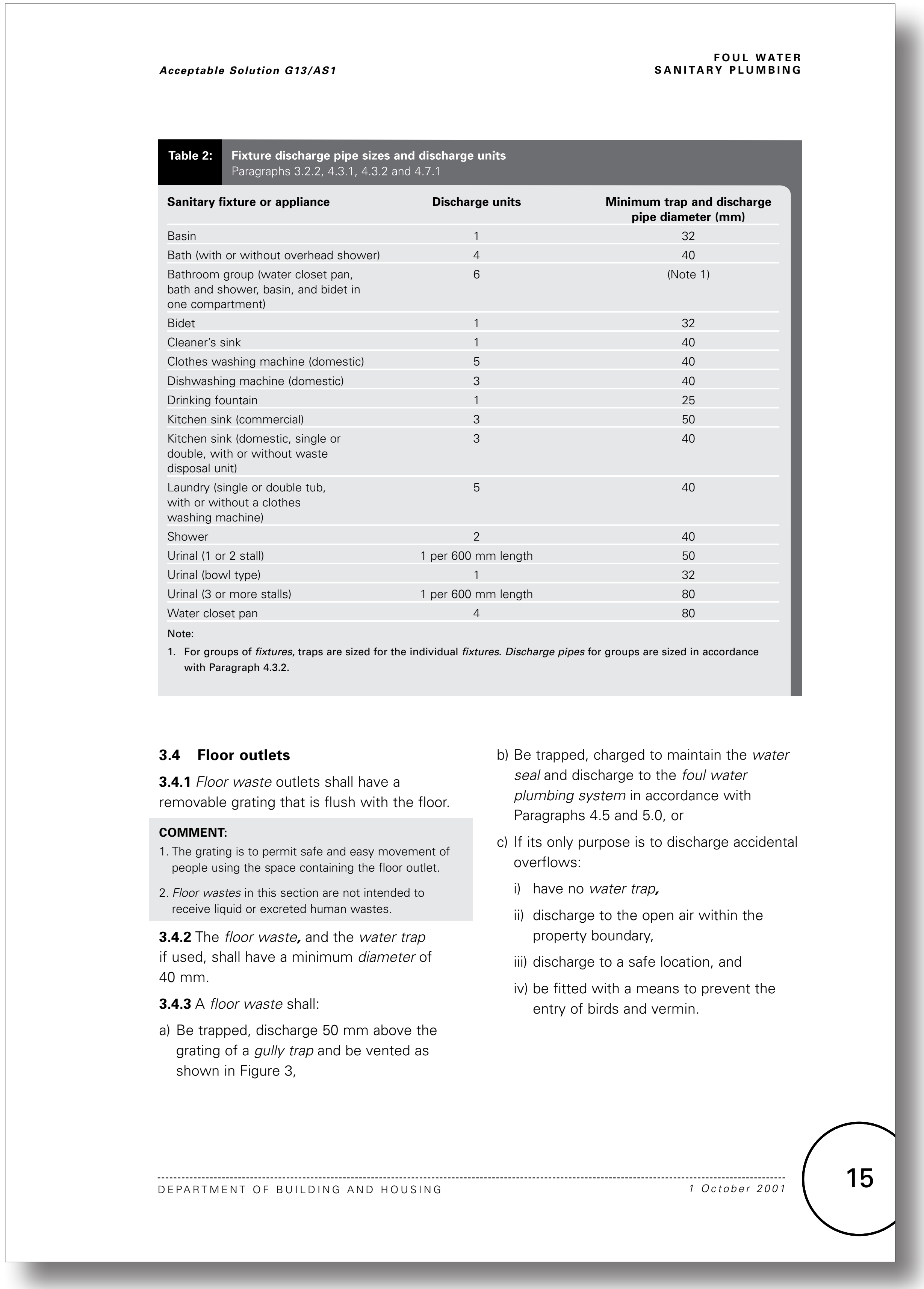
i) have no *water trap,*

ii) discharge to the open air within the property boundary,

iii) discharge to a safe location, and

iv) be fitted with a means to prevent the entry of birds and vermin.

Proposed G13 Foul Water - No changes proposed to this page



Acceptable Solution G13/AS1

FOUL WATER
SANITARY PLUMBING

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Paragraphs 3.2.2, 4.3.1, 4.3.2 and 4.7.1

Sanitary fixture or appliance	Discharge units	Minimum trap and discharge pipe diameter (mm)
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Bidet	1	32
Cleaner's sink	1	40
Clothes washing machine (domestic)	5	40
Dishwashing machine (domestic)	3	40
Drinking fountain	1	25
Kitchen sink (commercial)	3	50
Kitchen sink (domestic, single or double, with or without waste disposal unit)	3	40
Laundry (single or double tub, with or without a clothes washing machine)	5	40
Shower	2	40
Urinal (1 or 2 stall)	1 per 600 mm length	50
Urinal (bowl type)	1	32
Urinal (3 or more stalls)	1 per 600 mm length	80
Water closet pan	4	80

Note:

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c) If its only purpose is to discharge accidental overflows:

i) have no *water trap,*

ii) discharge to the open air within the property boundary,

iii) discharge to a safe location, and

iv) be fitted with a means to prevent the entry of birds and vermin.

DEPARTMENT OF BUILDING AND HOUSING *1 October 2001* 15

Current G13 Foul Water - No changes proposed to this page

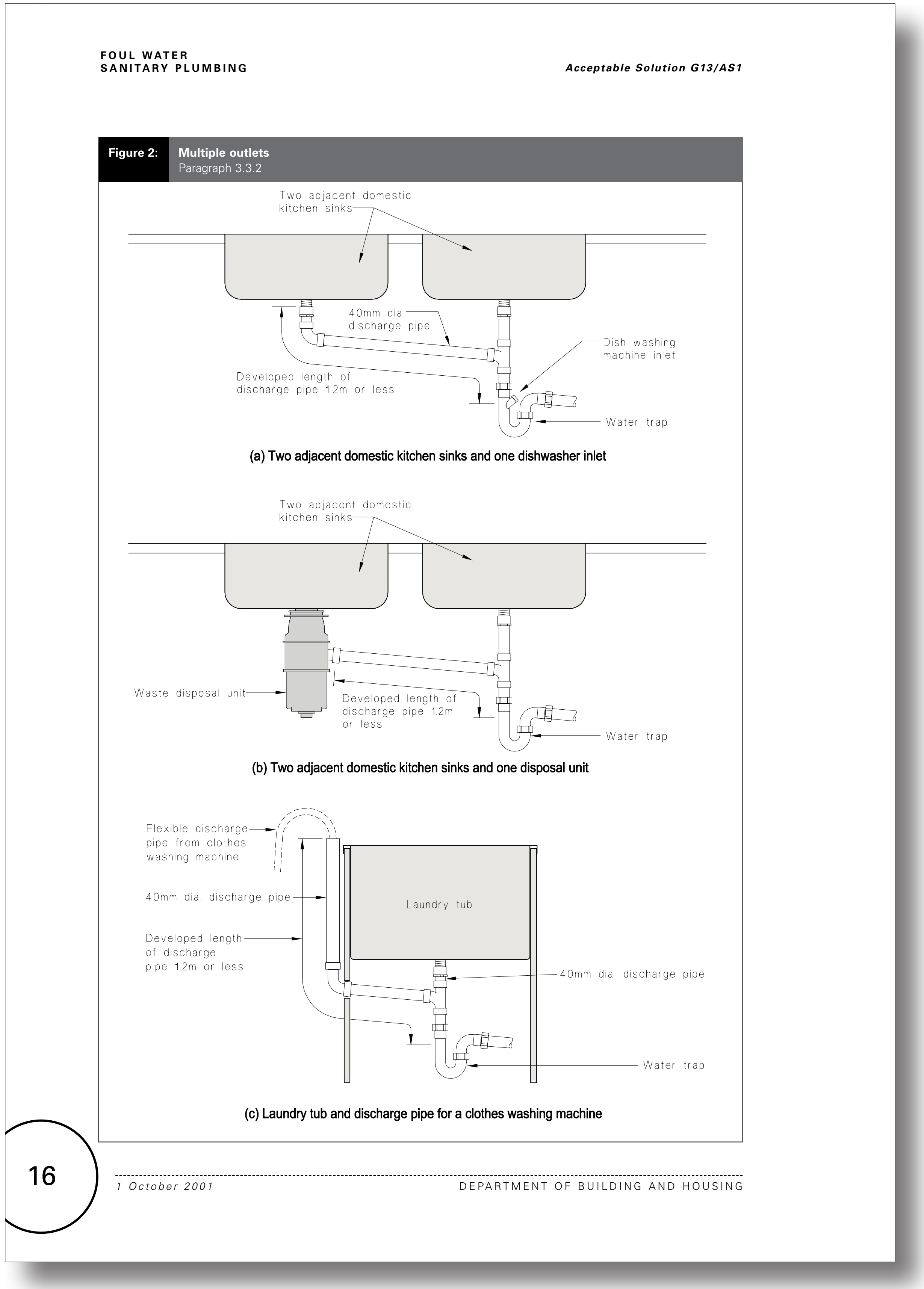


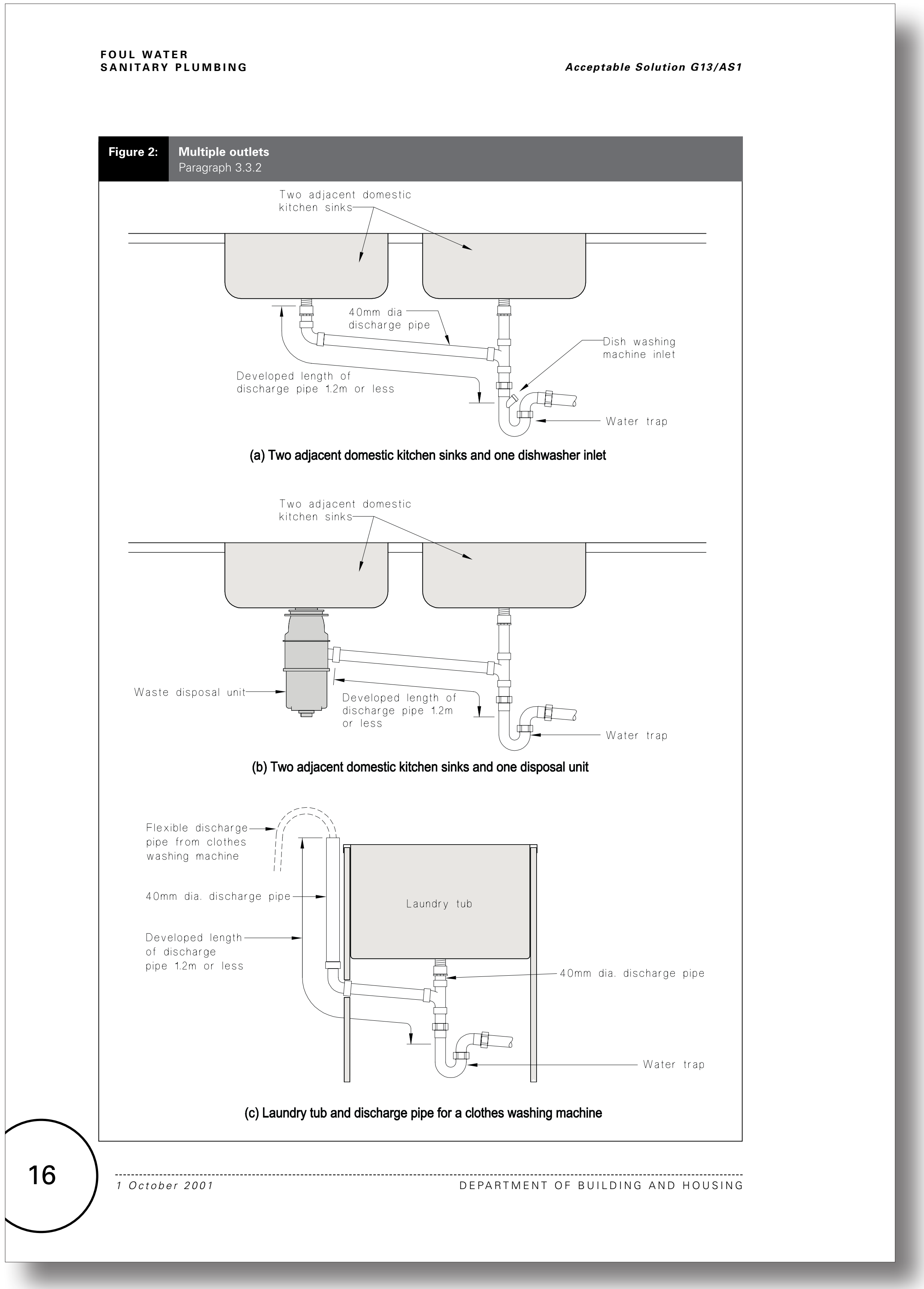
Figure 2: **Multiple outlets**
Paragraph 3.3.2

(a) Two adjacent domestic kitchen sinks and one dishwasher inlet

(b) Two adjacent domestic kitchen sinks and one disposal unit

(c) Laundry tub and discharge pipe for a clothes washing machine

Proposed G13 Foul Water - No changes proposed to this page



FOUL WATER
SANITARY PLUMBING
Acceptable Solution G13/AS1

Figure 2: **Multiple outlets**
Paragraph 3.3.2

Two adjacent domestic kitchen sinks
40mm dia discharge pipe
Dish washing machine inlet
Developed length of discharge pipe 1.2m or less
Water trap

(a) Two adjacent domestic kitchen sinks and one dishwasher inlet

Two adjacent domestic kitchen sinks
Waste disposal unit
Developed length of discharge pipe 1.2m or less
Water trap

(b) Two adjacent domestic kitchen sinks and one disposal unit

Flexible discharge pipe from clothes washing machine
40mm dia. discharge pipe
Developed length of discharge pipe 1.2m or less
Laundry tub
40mm dia. discharge pipe
Water trap

(c) Laundry tub and discharge pipe for a clothes washing machine

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1 October 2001
DEPARTMENT OF BUILDING AND HOUSING

Current G13 Foul Water - No changes proposed to this page

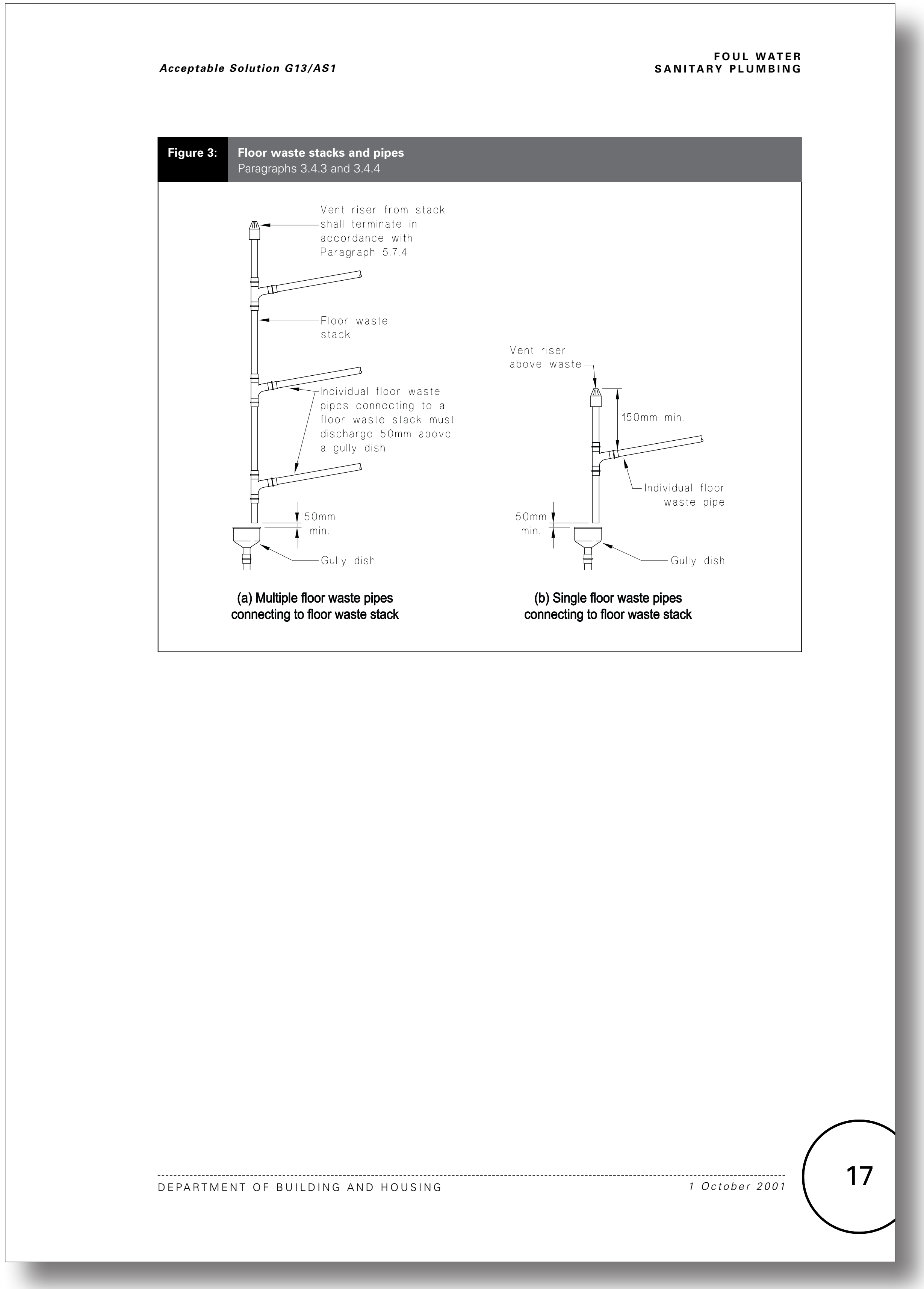

Figure 3: **Floor waste stacks and pipes**
Paragraphs 3.4.3 and 3.4.4

(a) Multiple floor waste pipes connecting to floor waste stack

(b) Single floor waste pipes connecting to floor waste stack

Proposed G13 Foul Water - No changes proposed to this page

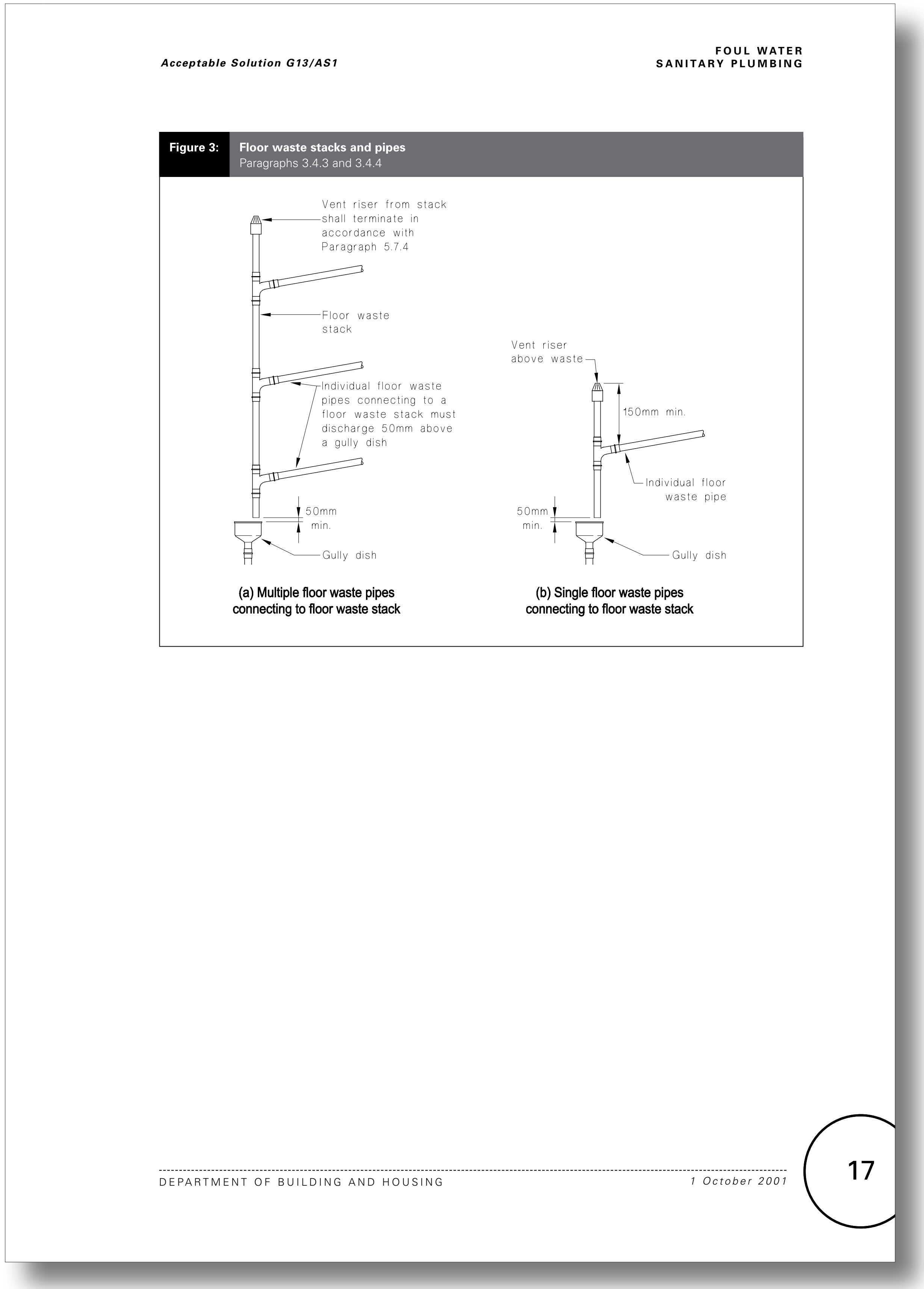

Figure 3: **Floor waste stacks and pipes**
Paragraphs 3.4.3 and 3.4.4

(a) Multiple floor waste pipes connecting to floor waste stack

(b) Single floor waste pipes connecting to floor waste stack

Current G13 Foul Water - No changes proposed to this page

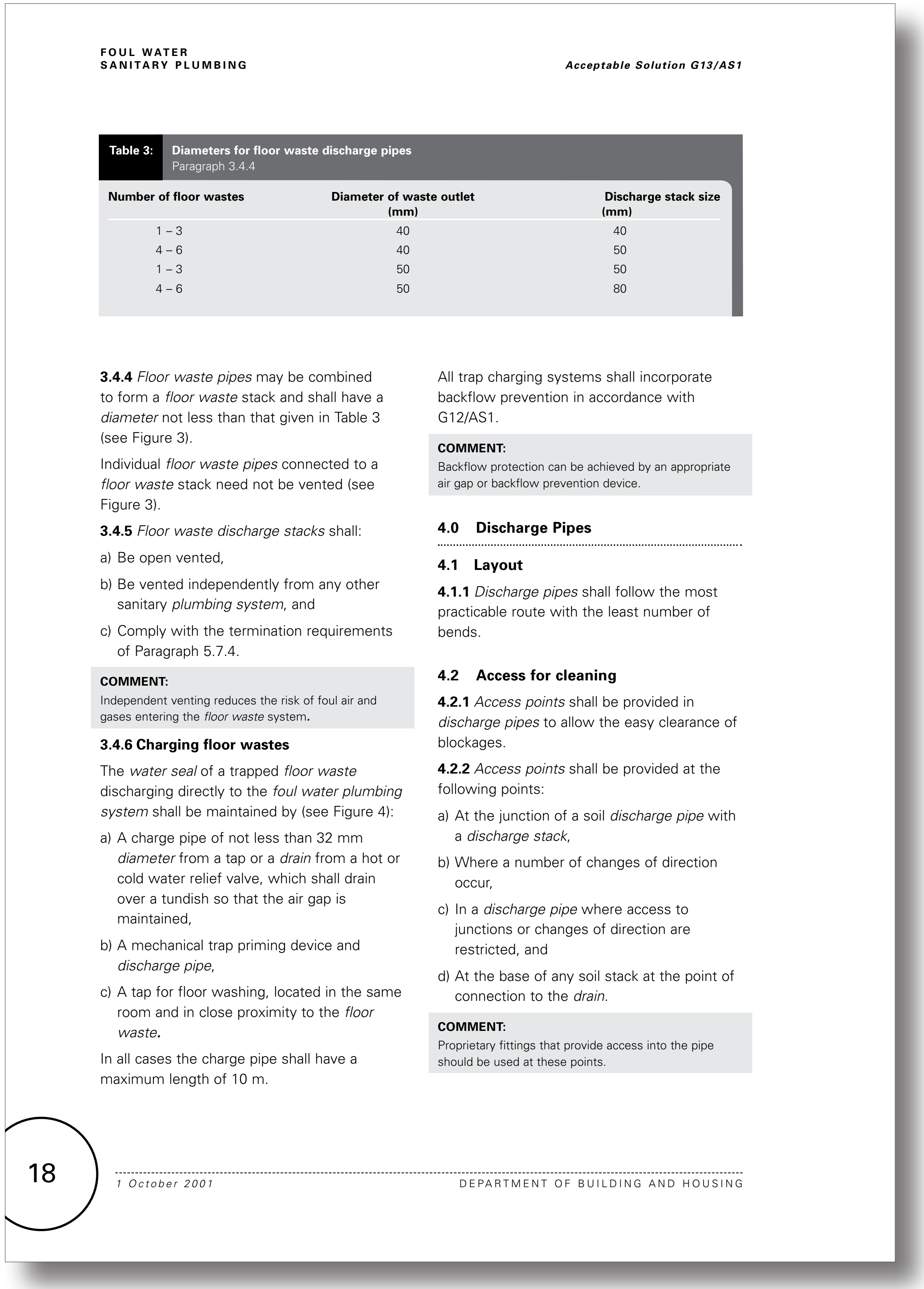

Table 3: **Diameters for floor waste discharge pipes**
Paragraph 3.4.4

Number of floor wastes	Diameter of waste outlet (mm)	Discharge stack size (mm)
1 – 3	40	40
4 – 6	40	50
1 – 3	50	50
4 – 6	50	80

3.4.4 *Floor waste pipes* may be combined to form a *floor waste* stack and shall have a *diameter* not less than that given in Table 3 (see Figure 3).

Individual *floor waste pipes* connected to a *floor waste* stack need not be vented (see Figure 3).

3.4.5 *Floor waste discharge stacks* shall:

a) Be open vented,

b) Be vented independently from any other sanitary *plumbing system*, and

c) Comply with the termination requirements of Paragraph 5.7.4.

COMMENT:
Independent venting reduces the risk of foul air and gases entering the *floor waste* system.

3.4.6 Charging floor wastes

The *water seal* of a trapped *floor waste* discharging directly to the *foul water plumbing system* shall be maintained by (see Figure 4):

a) A charge pipe of not less than 32 mm *diameter* from a tap or a *drain* from a hot or cold water relief valve, which shall drain over a tundish so that the air gap is maintained,

b) A mechanical trap priming device and *discharge pipe*,

c) A tap for floor washing, located in the same room and in close proximity to the *floor waste.*

In all cases the charge pipe shall have a maximum length of 10 m.

All trap charging systems shall incorporate backflow prevention in accordance with G12/AS1.

COMMENT:
Backflow protection can be achieved by an appropriate air gap or backflow prevention device.

4.0 Discharge Pipes

4.1 Layout

4.1.1 *Discharge pipes* shall follow the most practicable route with the least number of bends.

4.2 Access for cleaning

4.2.1 *Access points* shall be provided in *discharge pipes* to allow the easy clearance of blockages.

4.2.2 *Access points* shall be provided at the following points:

a) At the junction of a soil *discharge pipe* with a *discharge stack*,

b) Where a number of changes of direction occur,

c) In a *discharge pipe* where access to junctions or changes of direction are restricted, and

d) At the base of any soil stack at the point of connection to the *drain.*

COMMENT:
Proprietary fittings that provide access into the pipe should be used at these points.

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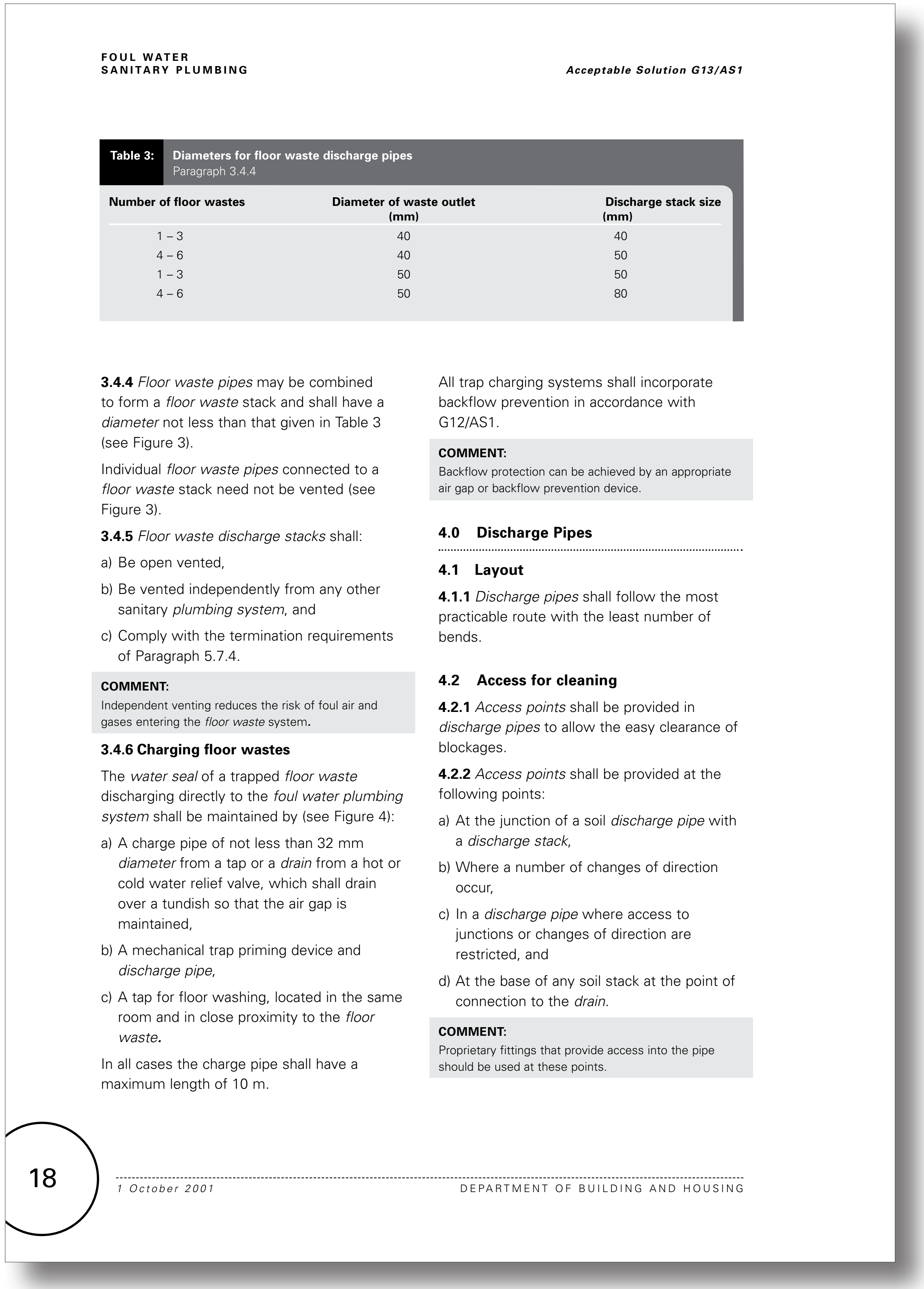

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Table 3: **Diameters for floor waste discharge pipes**
Paragraph 3.4.4

Number of floor wastes	Diameter of waste outlet (mm)	Discharge stack size (mm)
1 – 3	40	40
4 – 6	40	50
1 – 3	50	50
4 – 6	50	80

3.4.4 *Floor waste pipes* may be combined to form a *floor waste* stack and shall have a *diameter* not less than that given in Table 3 (see Figure 3).

Individual *floor waste pipes* connected to a *floor waste* stack need not be vented (see Figure 3).

3.4.5 *Floor waste discharge stacks* shall:

a) Be open vented,

b) Be vented independently from any other sanitary *plumbing system*, and

c) Comply with the termination requirements of Paragraph 5.7.4.

COMMENT:
Independent venting reduces the risk of foul air and gases entering the *floor waste* system.

3.4.6 Charging floor wastes

The *water seal* of a trapped *floor waste* discharging directly to the *foul water plumbing system* shall be maintained by (see Figure 4):

a) A charge pipe of not less than 32 mm *diameter* from a tap or a *drain* from a hot or cold water relief valve, which shall drain over a tundish so that the air gap is maintained,

b) A mechanical trap priming device and *discharge pipe*,

c) A tap for floor washing, located in the same room and in close proximity to the *floor waste.*

In all cases the charge pipe shall have a maximum length of 10 m.

All trap charging systems shall incorporate backflow prevention in accordance with G12/AS1.

COMMENT:
Backflow protection can be achieved by an appropriate air gap or backflow prevention device.

4.0 Discharge Pipes

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4.2.2 *Access points* shall be provided at the following points:

a) At the junction of a soil *discharge pipe* with a *discharge stack*,

b) Where a number of changes of direction occur,

c) In a *discharge pipe* where access to junctions or changes of direction are restricted, and

d) At the base of any soil stack at the point of connection to the *drain.*

COMMENT:
Proprietary fittings that provide access into the pipe should be used at these points.

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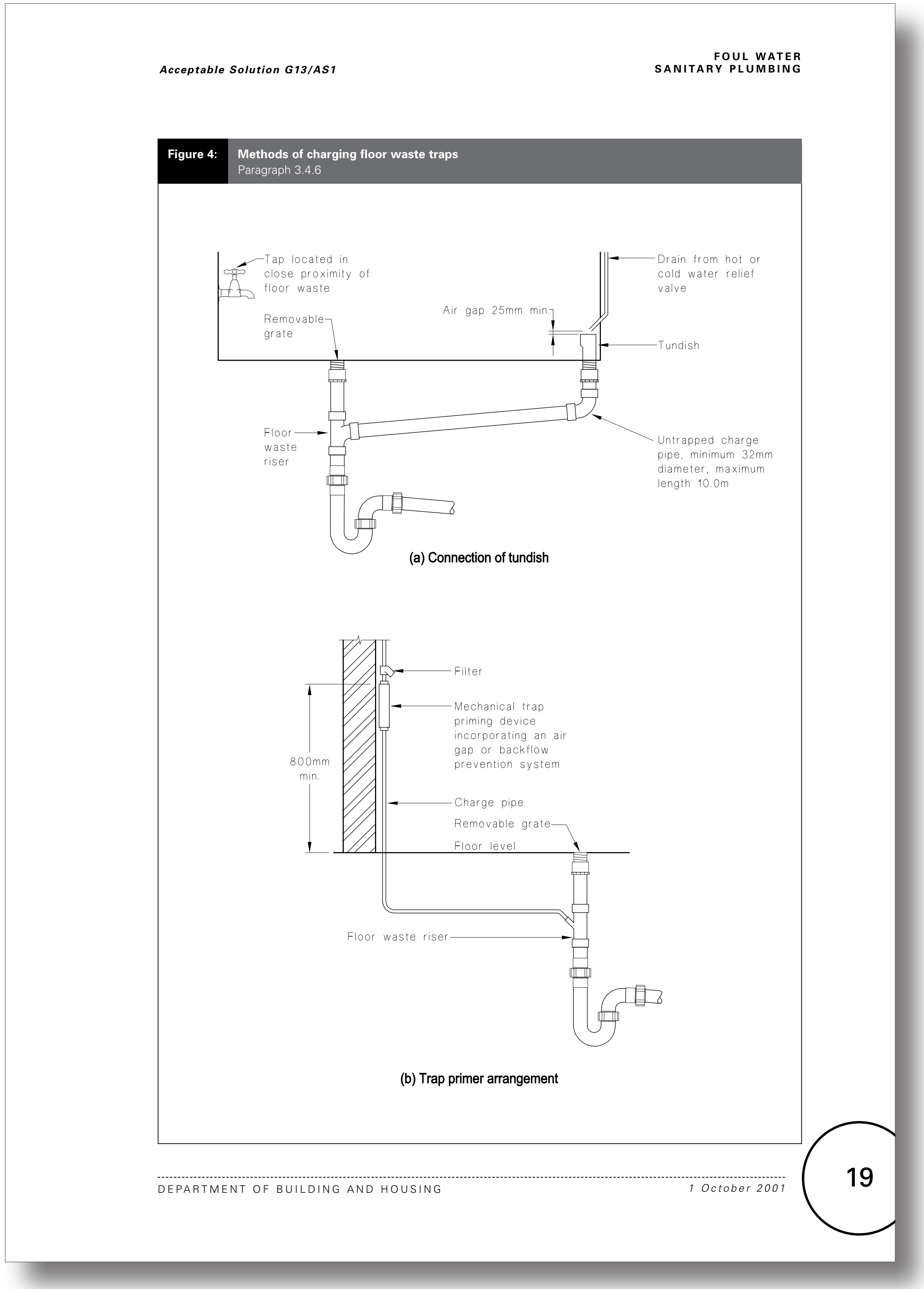

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Figure 4: **Methods of charging floor waste traps**
Paragraph 3.4.6

(a) Connection of tundish

(b) Trap primer arrangement

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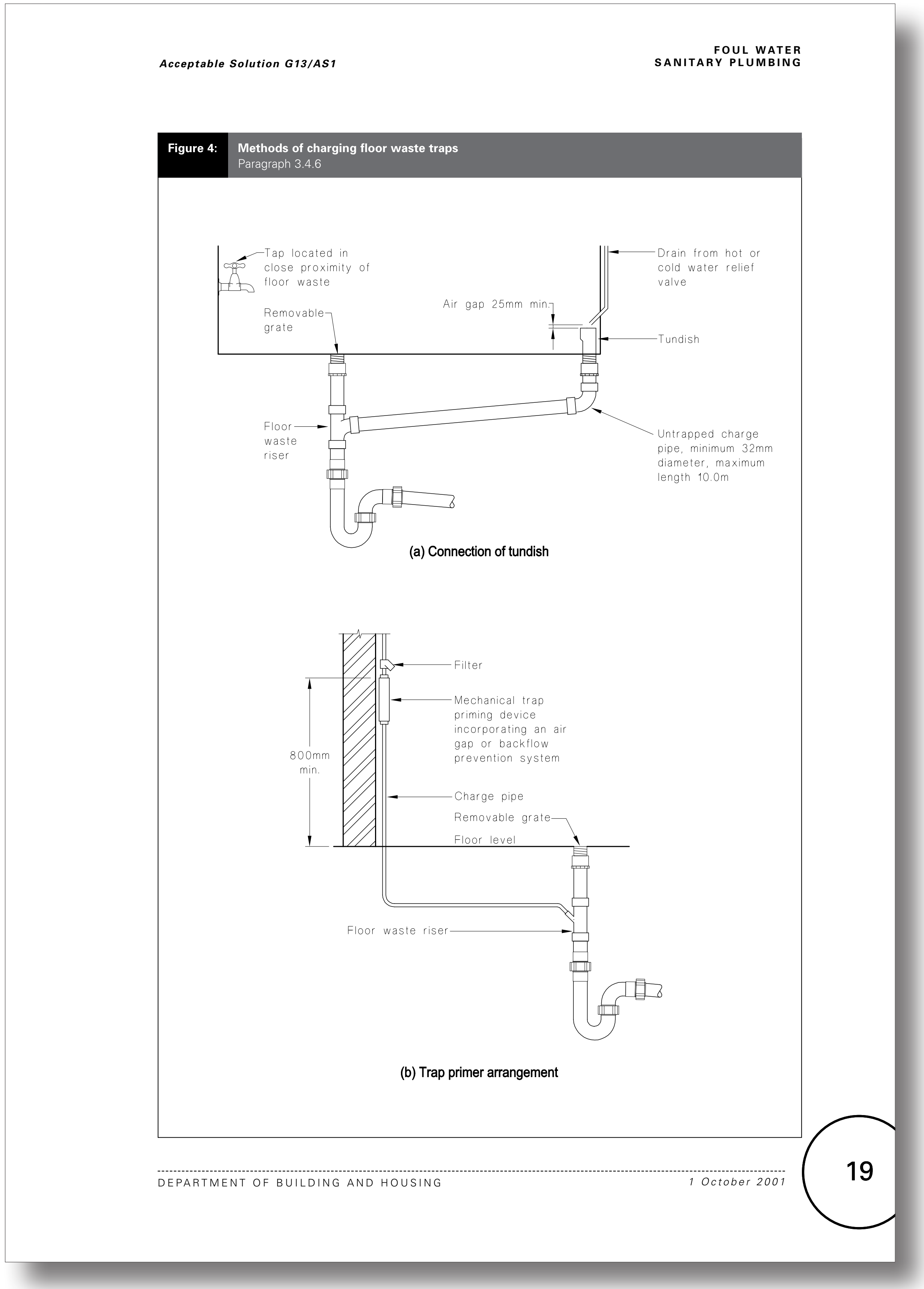

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Figure 4: **Methods of charging floor waste traps**
Paragraph 3.4.6

Tap located in close proximity of floor waste
Removable grate
Air gap 25mm min.
Drain from hot or cold water relief valve
Tundish
Floor waste riser
Untrapped charge pipe, minimum 32mm diameter, maximum length 10.0m

(a) Connection of tundish

Filter
Mechanical trap priming device incorporating an air gap or backflow prevention system
800mm min.
Charge pipe
Removable grate
Floor level
Floor waste riser

(b) Trap primer arrangement

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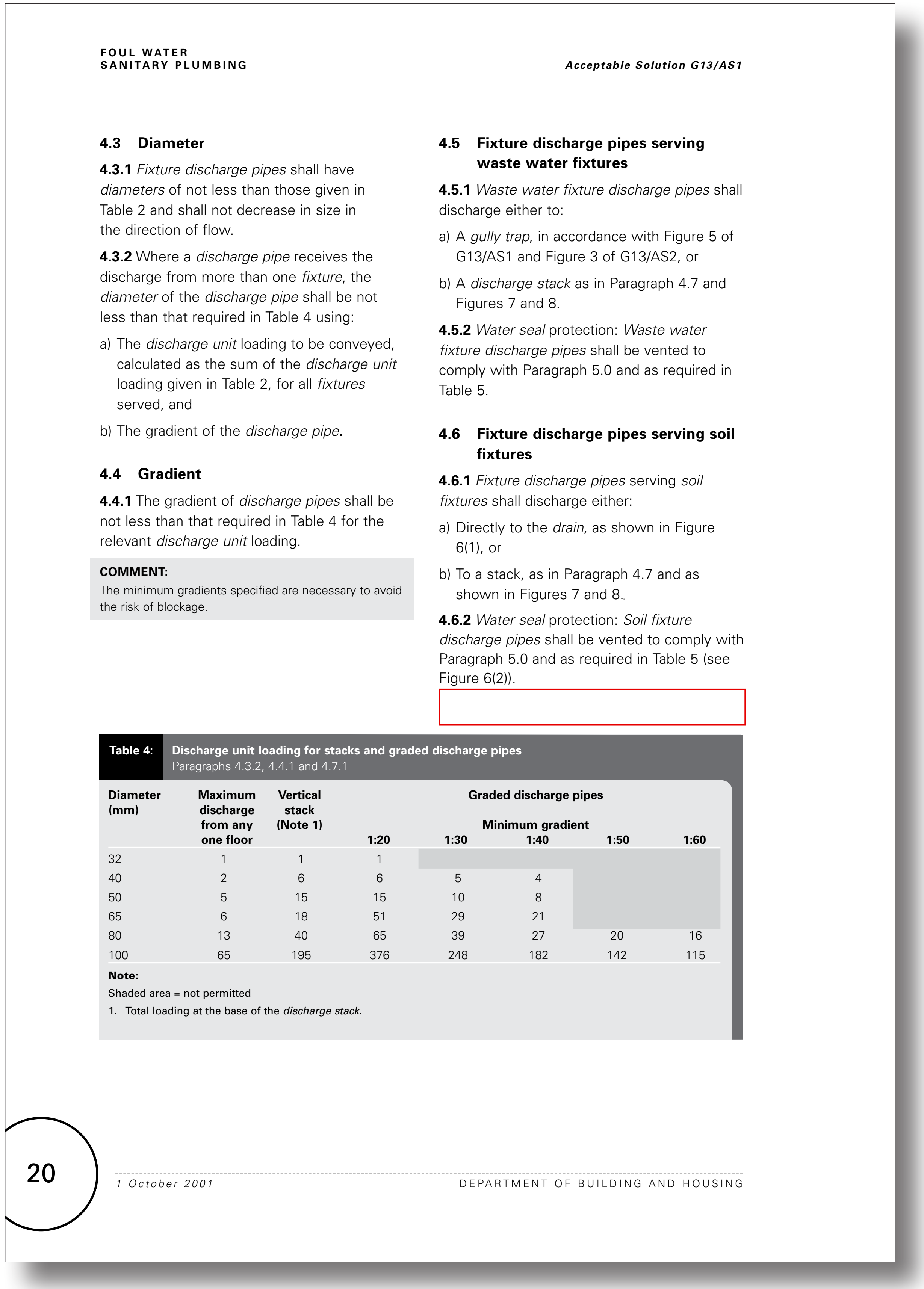

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4.3 Diameter

4.3.1 *Fixture discharge pipes* shall have *diameters* of not less than those given in Table 2 and shall not decrease in size in the direction of flow.

4.3.2 Where a *discharge pipe* receives the discharge from more than one *fixture*, the *diameter* of the *discharge pipe* shall be not less than that required in Table 4 using:

a) The *discharge unit* loading to be conveyed, calculated as the sum of the *discharge unit* loading given in Table 2, for all *fixtures* served, and

b) The gradient of the *discharge pipe*.

4.4 Gradient

4.4.1 The gradient of *discharge pipes* shall be not less than that required in Table 4 for the relevant *discharge unit* loading.

COMMENT:
The minimum gradients specified are necessary to avoid the risk of blockage.

4.5 Fixture discharge pipes serving waste water fixtures

4.5.1 *Waste water fixture discharge pipes* shall discharge either to:

a) A *gully trap*, in accordance with Figure 5 of G13/AS1 and Figure 3 of G13/AS2, or

b) A *discharge stack* as in Paragraph 4.7 and Figures 7 and 8.

4.5.2 *Water seal* protection: *Waste water fixture discharge pipes* shall be vented to comply with Paragraph 5.0 and as required in Table 5.

4.6 Fixture discharge pipes serving soil fixtures

4.6.1 *Fixture discharge pipes* serving *soil fixtures* shall discharge either:

a) Directly to the *drain*, as shown in Figure 6(1), or

b) To a stack, as in Paragraph 4.7 and as shown in Figures 7 and 8.

4.6.2 *Water seal* protection: *Soil fixture discharge pipes* shall be vented to comply with Paragraph 5.0 and as required in Table 5 (see Figure 6(2)).

Table 4: **Discharge unit loading for stacks and graded discharge pipes**
Paragraphs 4.3.2, 4.4.1 and 4.7.1

Diameter (mm)	Maximum discharge from any one floor	Vertical stack (Note 1)	Graded discharge pipes				
			Minimum gradient				
			1:20	1:30	1:40	1:50	1:60
32	1	1	1				
40	2	6	6	5	4		
50	5	15	15	10	8		
65	6	18	51	29	21		
80	13	40	65	39	27	20	16
100	65	195	376	248	182	142	115

Note:
Shaded area = not permitted
1. Total loading at the base of the *discharge stack*.

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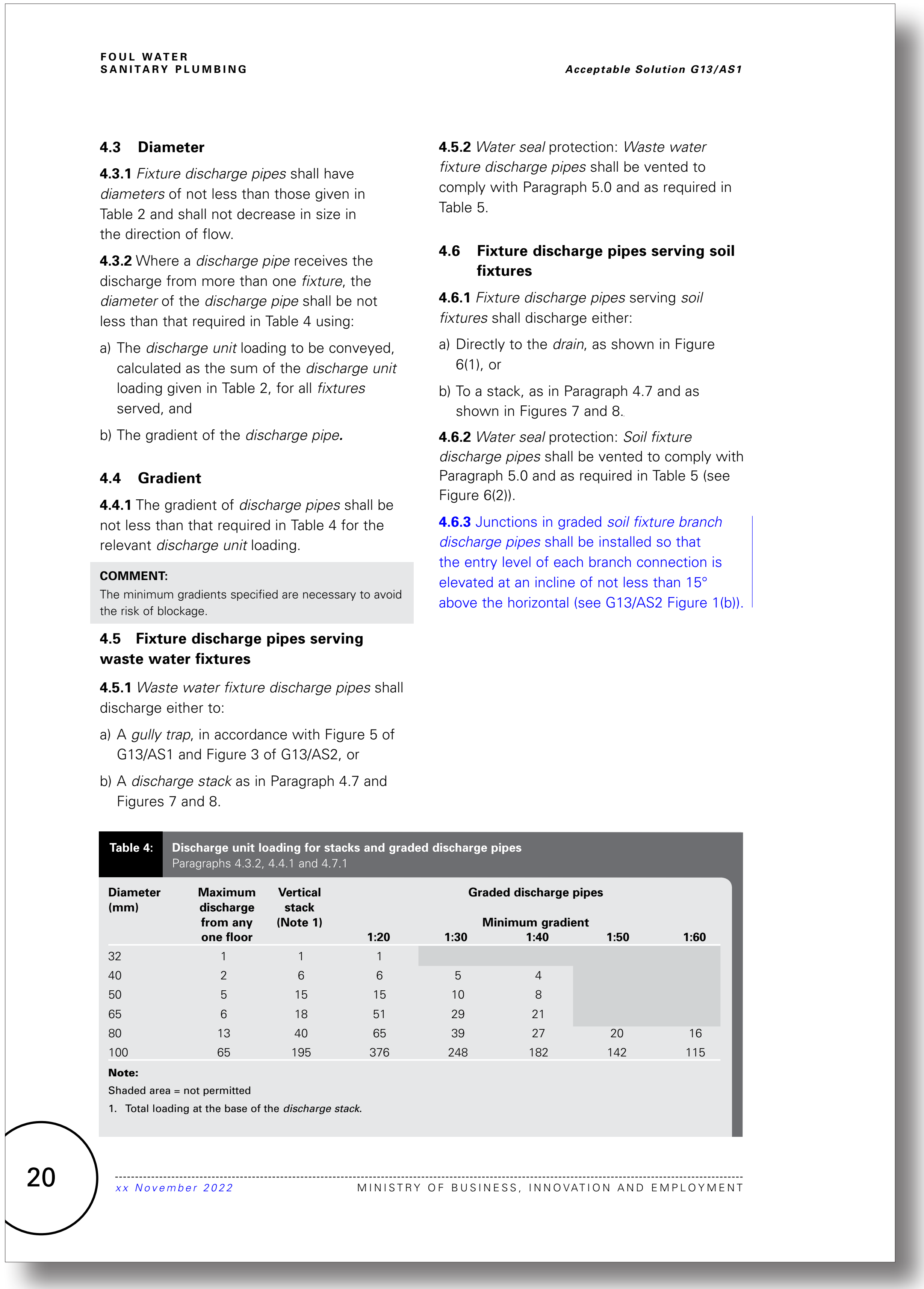

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4.3 Diameter

4.3.1 *Fixture discharge pipes* shall have *diameters* of not less than those given in Table 2 and shall not decrease in size in the direction of flow.

4.3.2 Where a *discharge pipe* receives the discharge from more than one *fixture*, the *diameter* of the *discharge pipe* shall be not less than that required in Table 4 using:

a) The *discharge unit* loading to be conveyed, calculated as the sum of the *discharge unit* loading given in Table 2, for all *fixtures* served, and

b) The gradient of the *discharge pipe*.

4.4 Gradient

4.4.1 The gradient of *discharge pipes* shall be not less than that required in Table 4 for the relevant *discharge unit* loading.

COMMENT:
The minimum gradients specified are necessary to avoid the risk of blockage.

4.5 Fixture discharge pipes serving waste water fixtures

4.5.1 *Waste water fixture discharge pipes* shall discharge either to:

a) A *gully trap*, in accordance with Figure 5 of G13/AS1 and Figure 3 of G13/AS2, or

b) A *discharge stack* as in Paragraph 4.7 and Figures 7 and 8.

4.5.2 *Water seal* protection: *Waste water fixture discharge pipes* shall be vented to comply with Paragraph 5.0 and as required in Table 5.

4.6 Fixture discharge pipes serving soil fixtures

4.6.1 *Fixture discharge pipes* serving *soil fixtures* shall discharge either:

a) Directly to the *drain*, as shown in Figure 6(1), or

b) To a stack, as in Paragraph 4.7 and as shown in Figures 7 and 8.

4.6.2 *Water seal* protection: *Soil fixture discharge pipes* shall be vented to comply with Paragraph 5.0 and as required in Table 5 (see Figure 6(2)).

4.6.3 Junctions in graded *soil fixture branch discharge pipes* shall be installed so that the entry level of each branch connection is elevated at an incline of not less than 15° above the horizontal (see G13/AS2 Figure 1(b)).

Table 4: **Discharge unit loading for stacks and graded discharge pipes**
Paragraphs 4.3.2, 4.4.1 and 4.7.1

Diameter (mm)	Maximum discharge from any one floor	Vertical stack (Note 1)	Graded discharge pipes				
			Minimum gradient				
			1:20	1:30	1:40	1:50	1:60
32	1	1	1				
40	2	6	6	5	4		
50	5	15	15	10	8		
65	6	18	51	29	21		
80	13	40	65	39	27	20	16
100	65	195	376	248	182	142	115

Note:
Shaded area = not permitted
1. Total loading at the base of the *discharge stack*.

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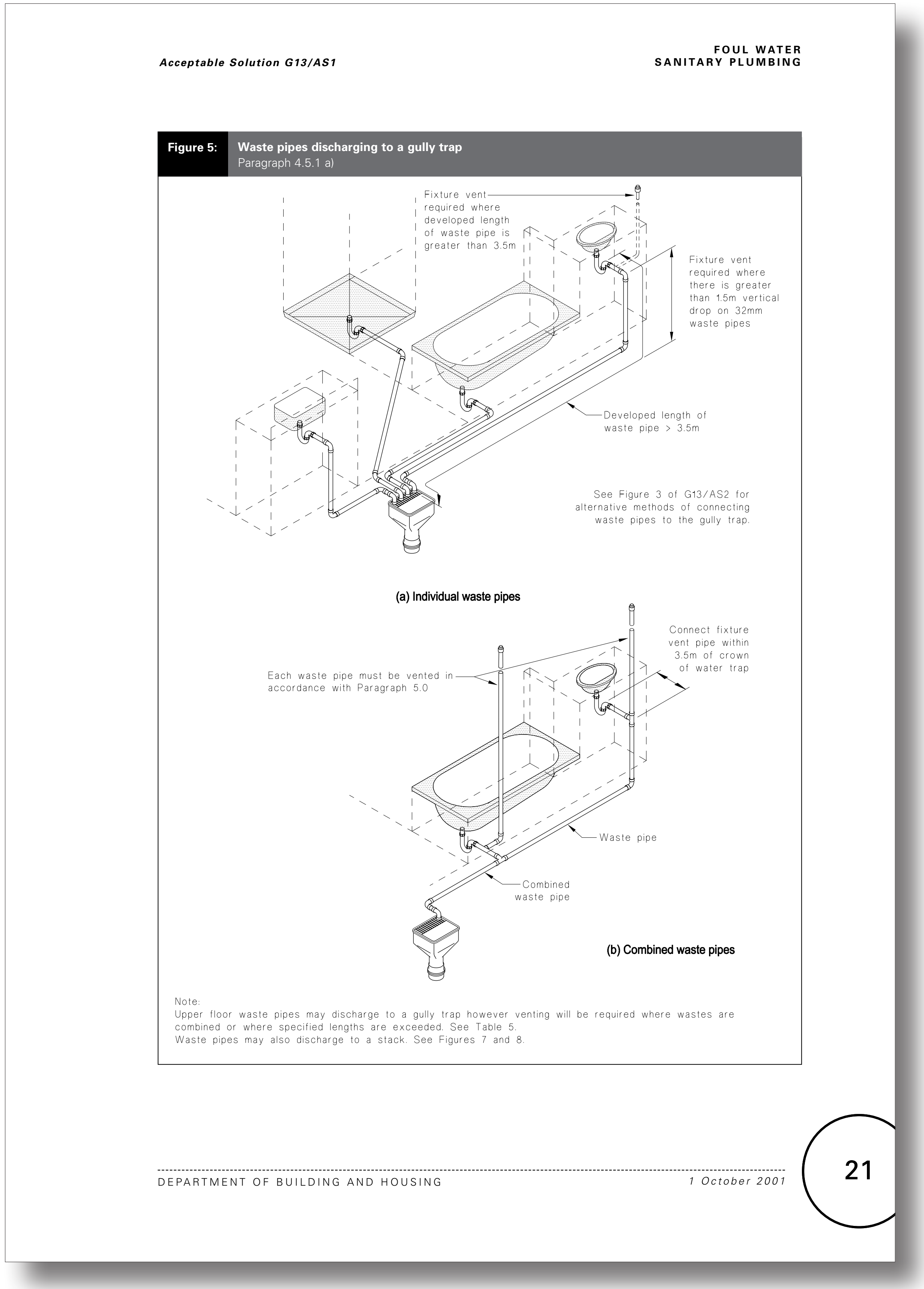

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Figure 5: **Waste pipes discharging to a gully trap**
Paragraph 4.5.1 a)

Fixture vent required where developed length of waste pipe is greater than 3.5m

Fixture vent required where there is greater than 1.5m vertical drop on 32mm waste pipes

Developed length of waste pipe > 3.5m

See Figure 3 of G13/AS2 for alternative methods of connecting waste pipes to the gully trap.

(a) Individual waste pipes

Each waste pipe must be vented in accordance with Paragraph 5.0

Connect fixture vent pipe within 3.5m of crown of water trap

Waste pipe

Combined waste pipe

(b) Combined waste pipes

Note:
Upper floor waste pipes may discharge to a gully trap however venting will be required where wastes are combined or where specified lengths are exceeded. See Table 5.
Waste pipes may also discharge to a stack. See Figures 7 and 8.

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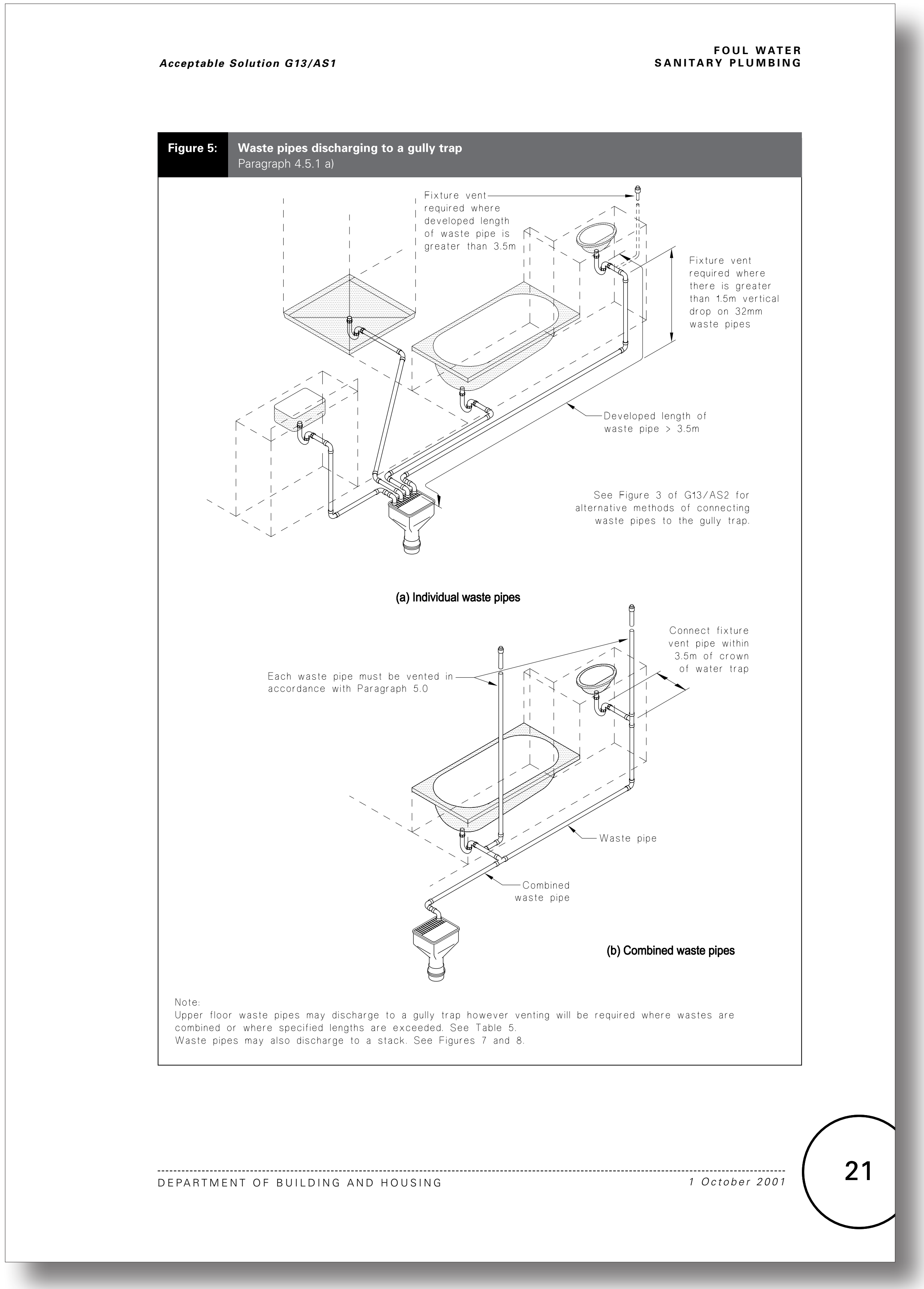

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Figure 5: **Waste pipes discharging to a gully trap**
Paragraph 4.5.1 a)

Fixture vent required where developed length of waste pipe is greater than 3.5m

Fixture vent required where there is greater than 1.5m vertical drop on 32mm waste pipes

Developed length of waste pipe > 3.5m

See Figure 3 of G13/AS2 for alternative methods of connecting waste pipes to the gully trap.

(a) Individual waste pipes

Each waste pipe must be vented in accordance with Paragraph 5.0

Connect fixture vent pipe within 3.5m of crown of water trap

Waste pipe

Combined waste pipe

(b) Combined waste pipes

Note:
Upper floor waste pipes may discharge to a gully trap however venting will be required where wastes are combined or where specified lengths are exceeded. See Table 5.
Waste pipes may also discharge to a stack. See Figures 7 and 8.

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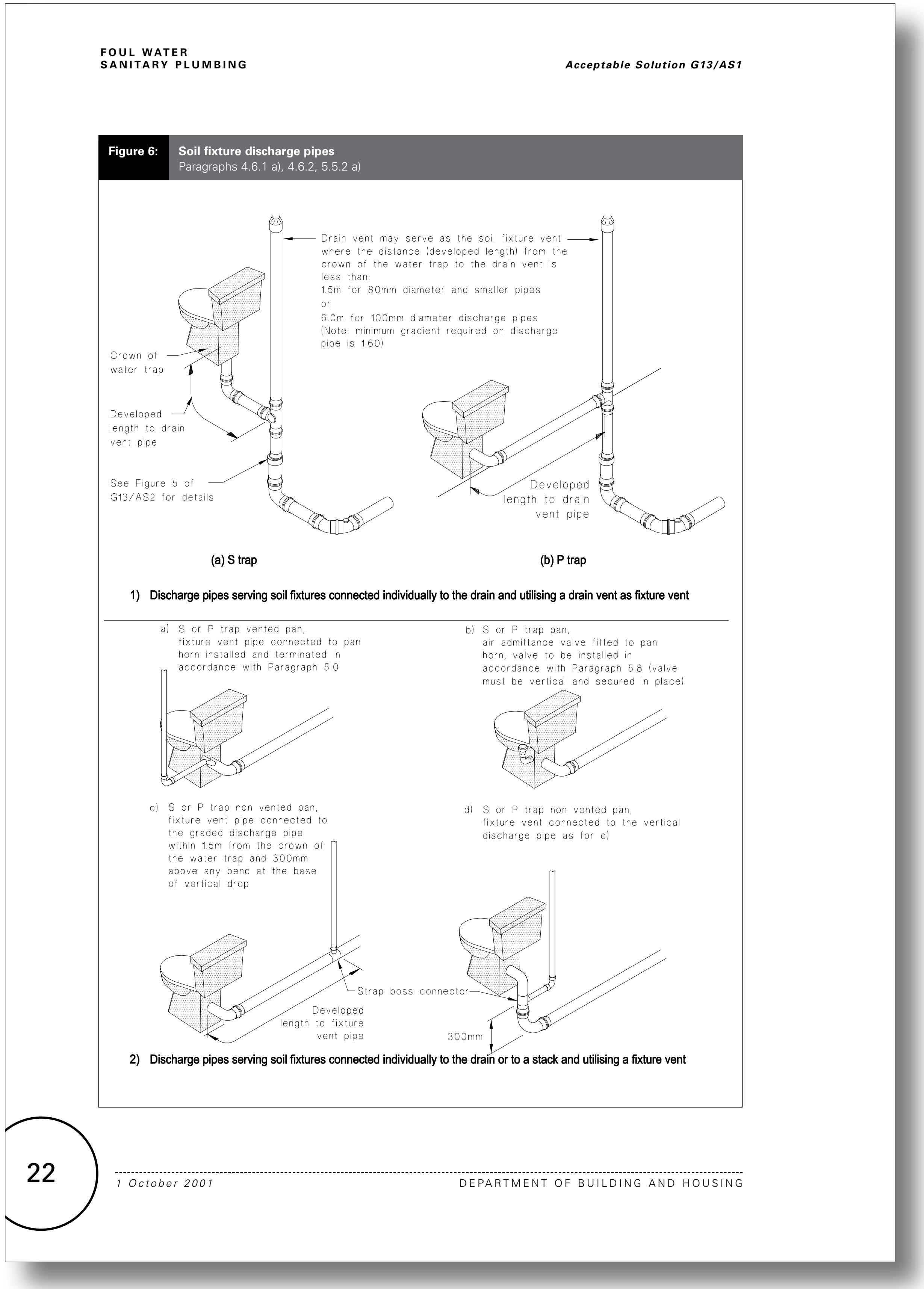

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Figure 6: **Soil fixture discharge pipes**
Paragraphs 4.6.1 a), 4.6.2, 5.5.2 a)

Drain vent may serve as the soil fixture vent where the distance (developed length) from the crown of the water trap to the drain vent is less than:
1.5m for 80mm diameter and smaller pipes
or
6.0m for 100mm diameter discharge pipes
(Note: minimum gradient required on discharge pipe is 1:60)

(a) S trap

(b) P trap

1) Discharge pipes serving soil fixtures connected individually to the drain and utilising a drain vent as fixture vent

a) S or P trap vented pan, fixture vent pipe connected to pan horn installed and terminated in accordance with Paragraph 5.0

b) S or P trap pan, air admittance valve fitted to pan horn, valve to be installed in accordance with Paragraph 5.8 (valve must be vertical and secured in place)

c) S or P trap non vented pan, fixture vent pipe connected to the graded discharge pipe within 1.5m from the crown of the water trap and 300mm above any bend at the base of vertical drop

d) S or P trap non vented pan, fixture vent connected to the vertical discharge pipe as for c)

2) Discharge pipes serving soil fixtures connected individually to the drain or to a stack and utilising a fixture vent

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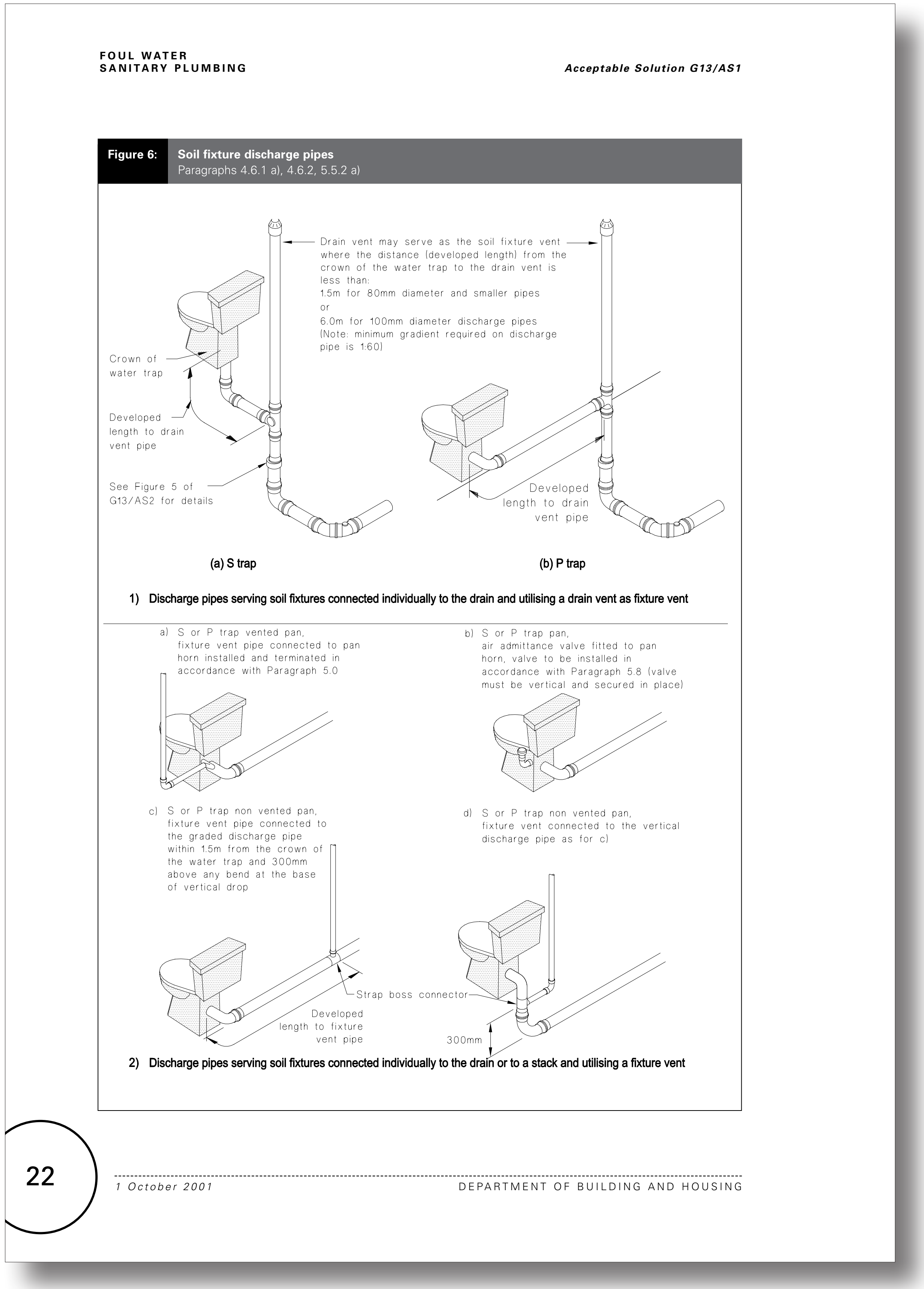

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Figure 6: **Soil fixture discharge pipes**
Paragraphs 4.6.1 a), 4.6.2, 5.5.2 a)

Drain vent may serve as the soil fixture vent where the distance (developed length) from the crown of the water trap to the drain vent is less than:
1.5m for 80mm diameter and smaller pipes
or
6.0m for 100mm diameter discharge pipes
(Note: minimum gradient required on discharge pipe is 1:60)

(a) S trap

(b) P trap

1) Discharge pipes serving soil fixtures connected individually to the drain and utilising a drain vent as fixture vent

a) S or P trap vented pan, fixture vent pipe connected to pan horn installed and terminated in accordance with Paragraph 5.0

b) S or P trap pan, air admittance valve fitted to pan horn, valve to be installed in accordance with Paragraph 5.8 (valve must be vertical and secured in place)

c) S or P trap non vented pan, fixture vent pipe connected to the graded discharge pipe within 1.5m from the crown of the water trap and 300mm above any bend at the base of vertical drop

d) S or P trap non vented pan, fixture vent connected to the vertical discharge pipe as for c)

2) Discharge pipes serving soil fixtures connected individually to the drain or to a stack and utilising a fixture vent

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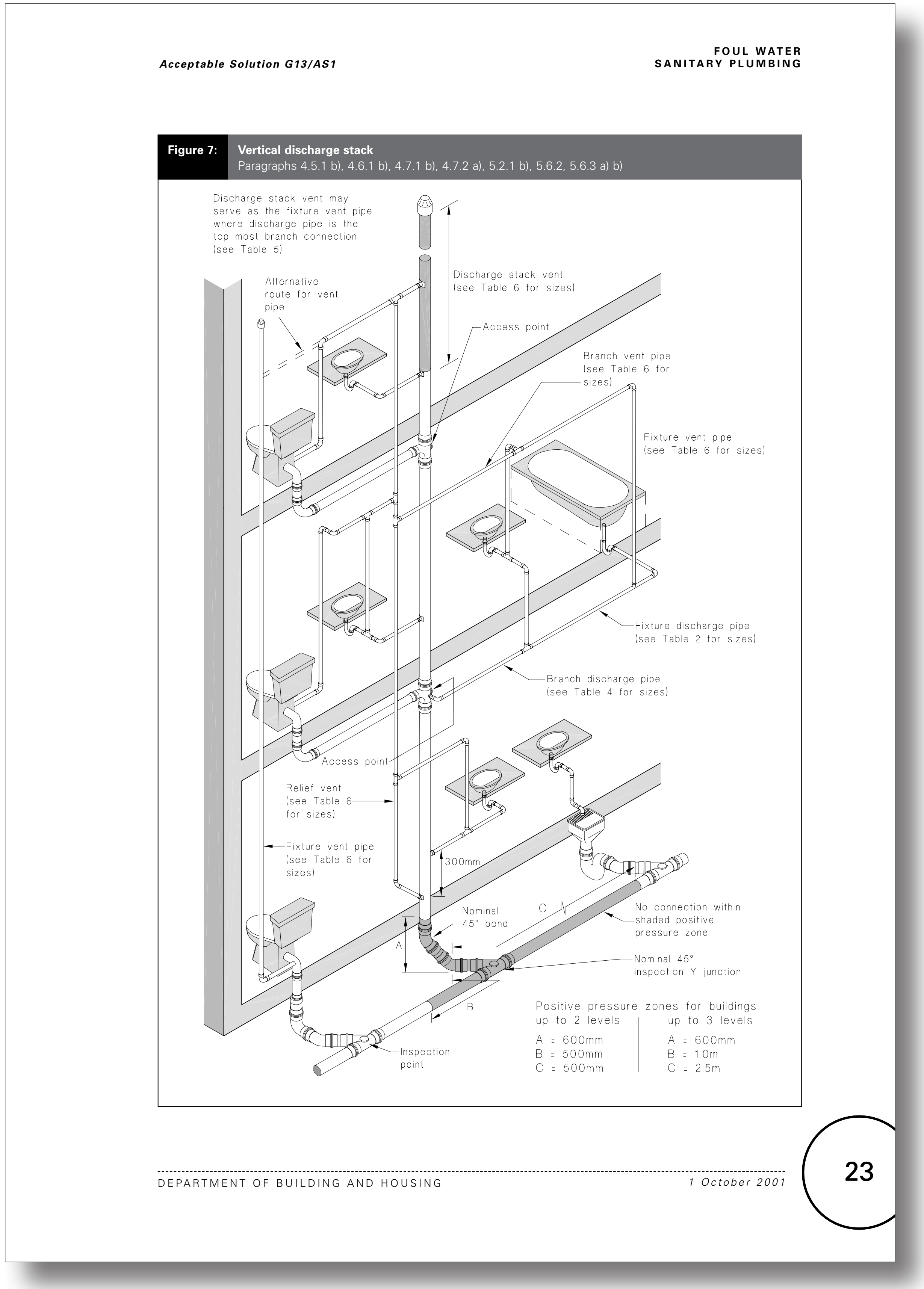

Figure 7: **Vertical discharge stack**
Paragraphs 4.5.1 b), 4.6.1 b), 4.7.1 b), 4.7.2 a), 5.2.1 b), 5.6.2, 5.6.3 a) b)

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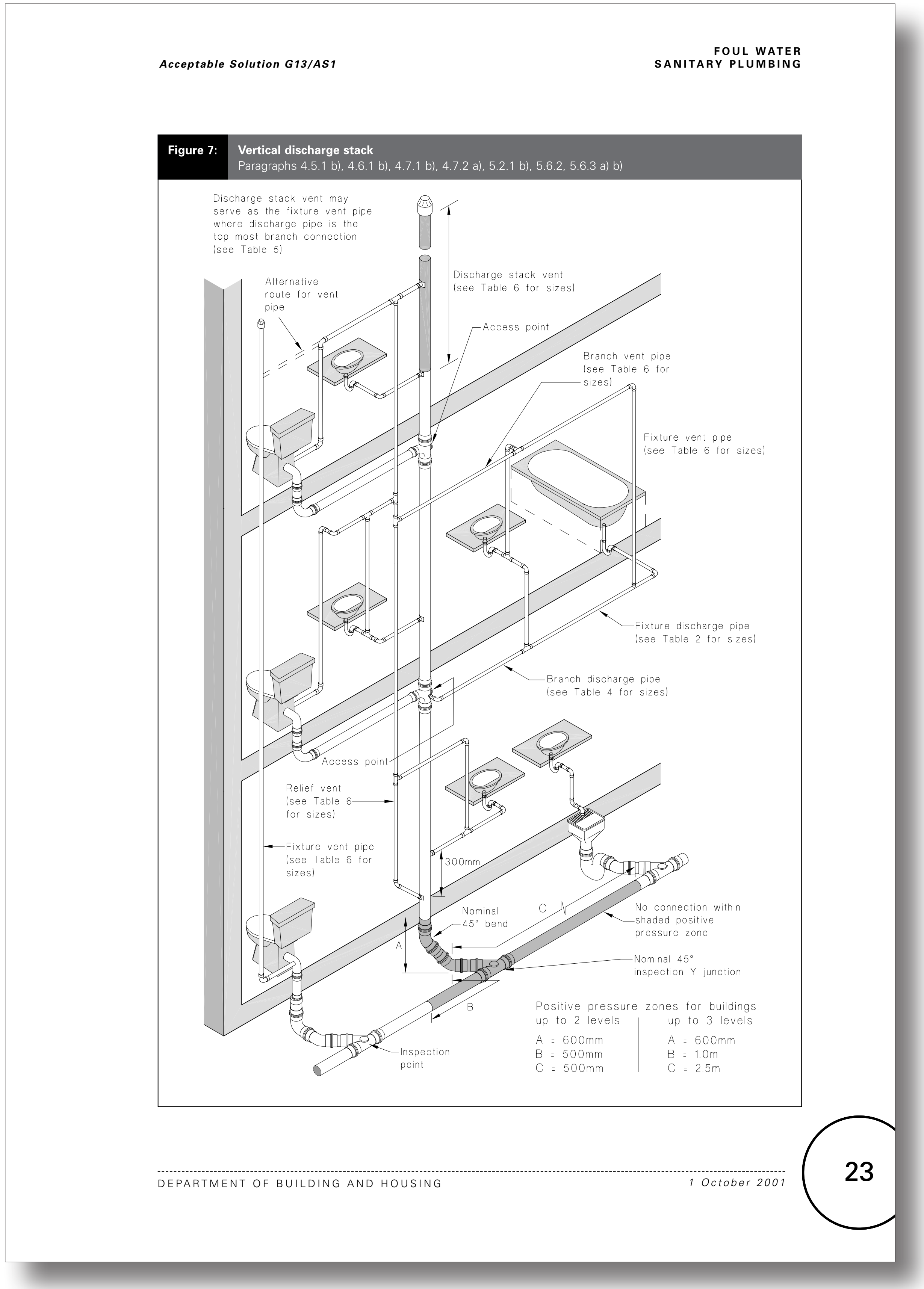

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Figure 7: **Vertical discharge stack**
Paragraphs 4.5.1 b), 4.6.1 b), 4.7.1 b), 4.7.2 a), 5.2.1 b), 5.6.2, 5.6.3 a) b)

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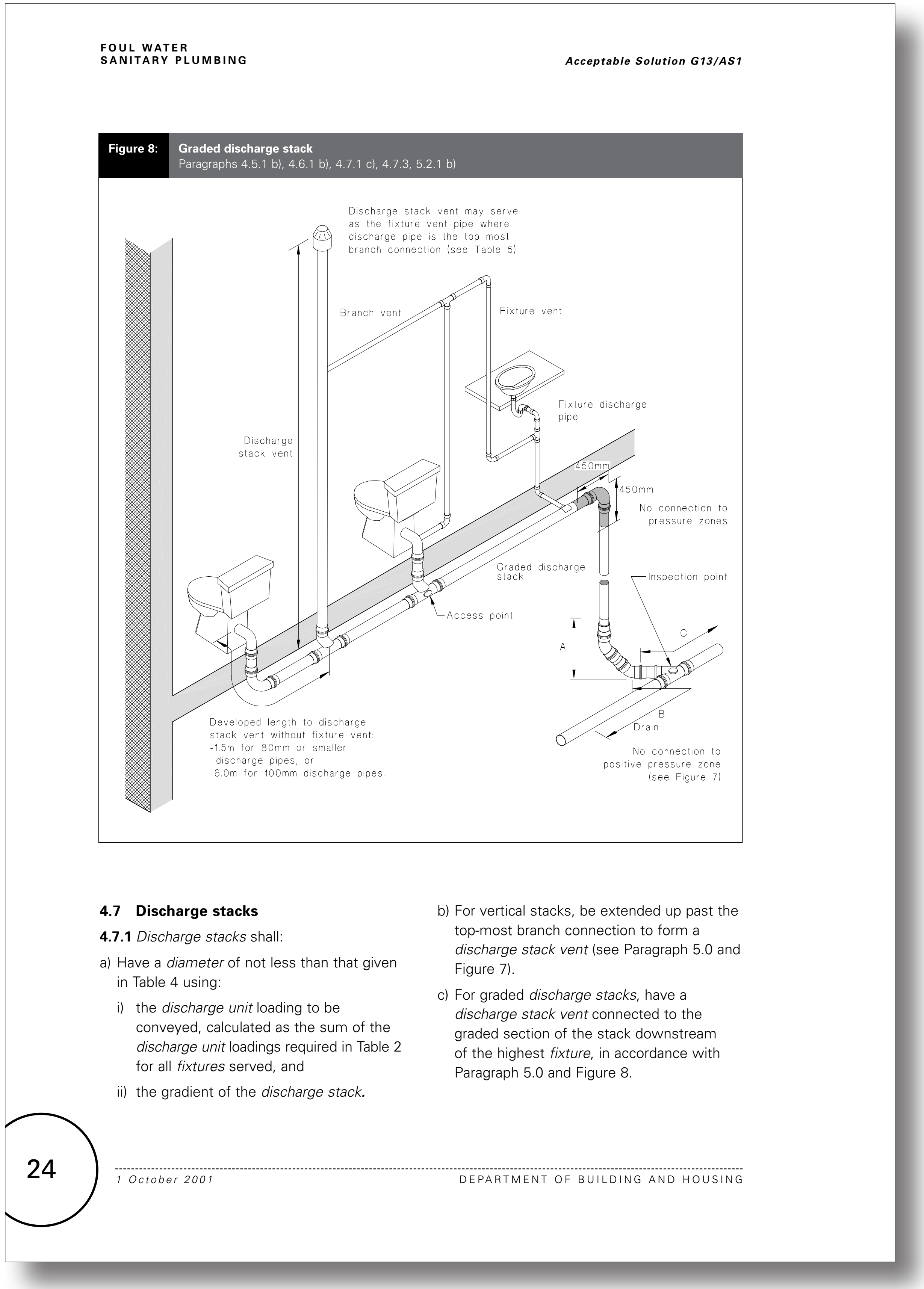

Figure 8: **Graded discharge stack**
Paragraphs 4.5.1 b), 4.6.1 b), 4.7.1 c), 4.7.3, 5.2.1 b)

4.7 Discharge stacks

4.7.1 *Discharge stacks* shall:

a) Have a *diameter* of not less than that given in Table 4 using:
   - i) the *discharge unit* loading to be conveyed, calculated as the sum of the *discharge unit* loadings required in Table 2 for all *fixtures* served, and
   - ii) the gradient of the *discharge stack*.

b) For vertical stacks, be extended up past the top-most branch connection to form a *discharge stack vent* (see Paragraph 5.0 and Figure 7).

c) For graded *discharge stacks*, have a *discharge stack vent* connected to the graded section of the stack downstream of the highest *fixture*, in accordance with Paragraph 5.0 and Figure 8.

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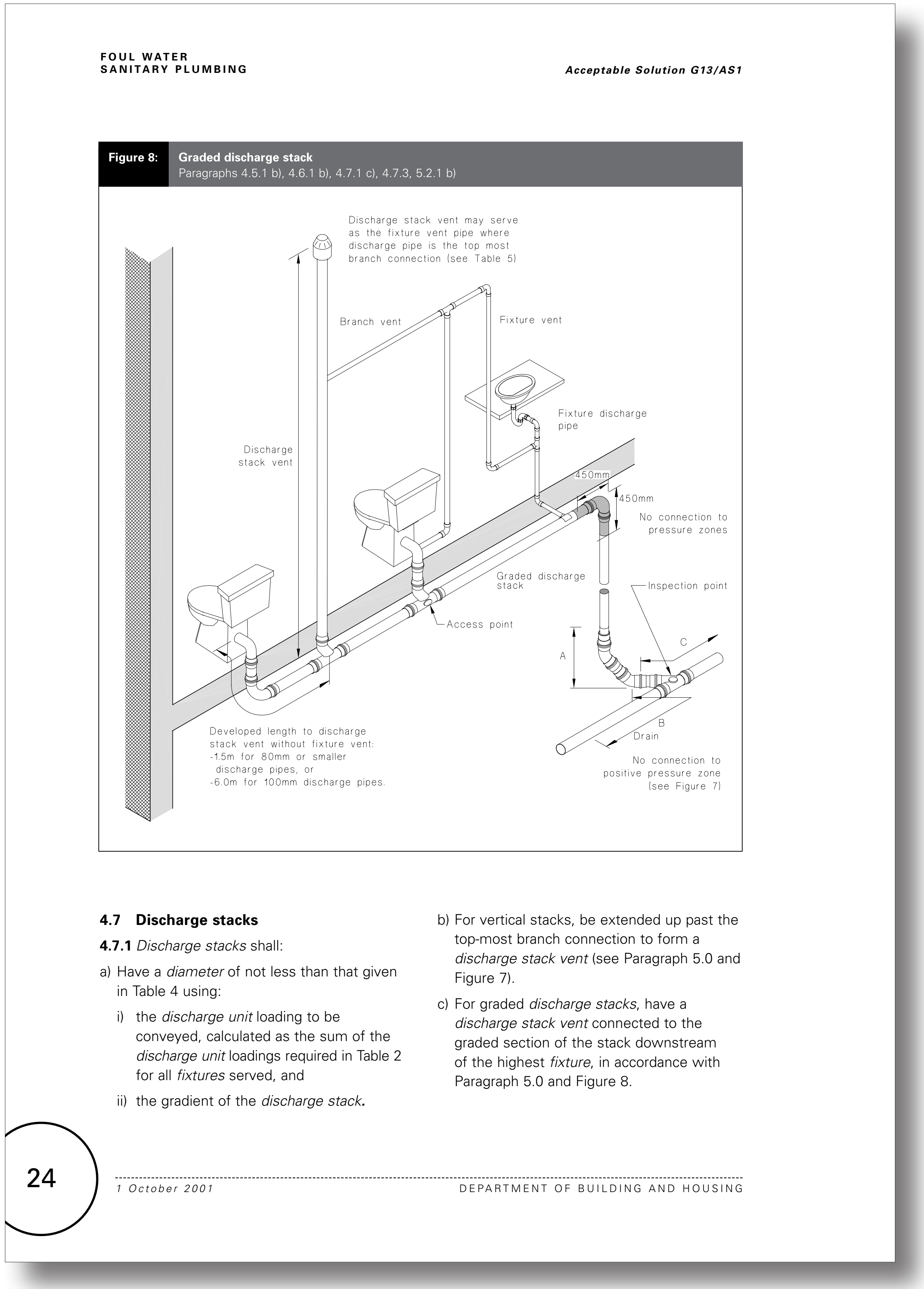

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Figure 8: **Graded discharge stack**
Paragraphs 4.5.1 b), 4.6.1 b), 4.7.1 c), 4.7.3, 5.2.1 b)

4.7 Discharge stacks

4.7.1 *Discharge stacks* shall:

a) Have a *diameter* of not less than that given in Table 4 using:
   - i) the *discharge unit* loading to be conveyed, calculated as the sum of the *discharge unit* loadings required in Table 2 for all *fixtures* served, and
   - ii) the gradient of the *discharge stack*.

b) For vertical stacks, be extended up past the top-most branch connection to form a *discharge stack vent* (see Paragraph 5.0 and Figure 7).

c) For graded *discharge stacks*, have a *discharge stack vent* connected to the graded section of the stack downstream of the highest *fixture*, in accordance with Paragraph 5.0 and Figure 8.

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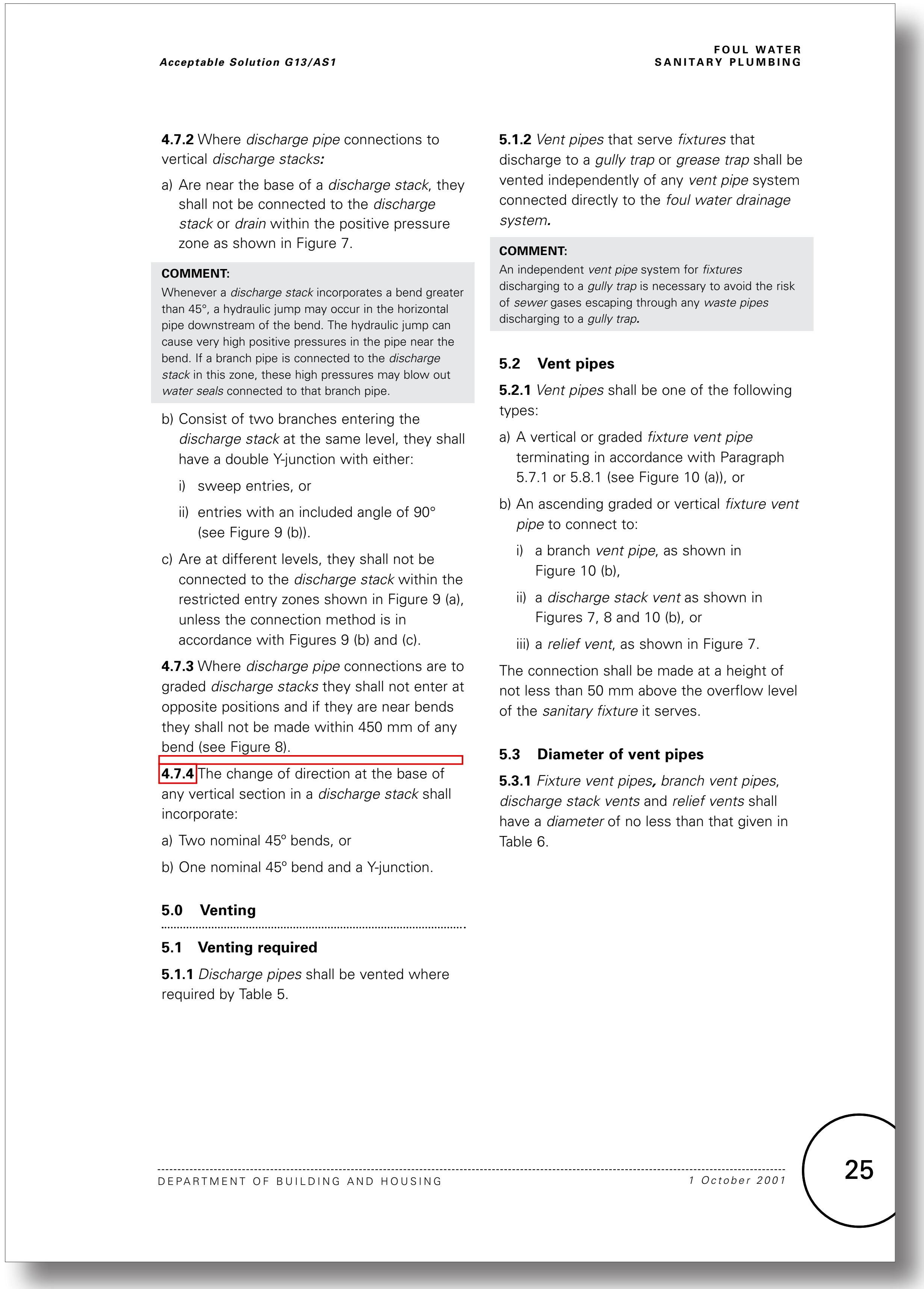

4.7.2 Where *discharge pipe* connections to vertical *discharge stacks:*

a) Are near the base of a *discharge stack*, they shall not be connected to the *discharge stack* or *drain* within the positive pressure zone as shown in Figure 7.

COMMENT:
Whenever a *discharge stack* incorporates a bend greater than 45°, a hydraulic jump may occur in the horizontal pipe downstream of the bend. The hydraulic jump can cause very high positive pressures in the pipe near the bend. If a branch pipe is connected to the *discharge stack* in this zone, these high pressures may blow out *water seals* connected to that branch pipe.

b) Consist of two branches entering the *discharge stack* at the same level, they shall have a double Y-junction with either:

i) sweep entries, or

ii) entries with an included angle of 90° (see Figure 9 (b)).

c) Are at different levels, they shall not be connected to the *discharge stack* within the restricted entry zones shown in Figure 9 (a), unless the connection method is in accordance with Figures 9 (b) and (c).

4.7.3 Where *discharge pipe* connections are to graded *discharge stacks* they shall not enter at opposite positions and if they are near bends they shall not be made within 450 mm of any bend (see Figure 8).

4.7.4 The change of direction at the base of any vertical section in a *discharge stack* shall incorporate:

a) Two nominal 45° bends, or

b) One nominal 45° bend and a Y-junction.

5.0 Venting

5.1 Venting required

5.1.1 *Discharge pipes* shall be vented where required by Table 5.

5.1.2 *Vent pipes* that serve *fixtures* that discharge to a *gully trap* or *grease trap* shall be vented independently of any *vent pipe* system connected directly to the *foul water drainage system.*

COMMENT:
An independent *vent pipe* system for *fixtures* discharging to a *gully trap* is necessary to avoid the risk of *sewer* gases escaping through any *waste pipes* discharging to a *gully trap.*

5.2 Vent pipes

5.2.1 *Vent pipes* shall be one of the following types:

a) A vertical or graded *fixture vent pipe* terminating in accordance with Paragraph 5.7.1 or 5.8.1 (see Figure 10 (a)), or

b) An ascending graded or vertical *fixture vent pipe* to connect to:

i) a branch *vent pipe*, as shown in Figure 10 (b),

ii) a *discharge stack vent* as shown in Figures 7, 8 and 10 (b), or

iii) a *relief vent*, as shown in Figure 7.

The connection shall be made at a height of not less than 50 mm above the overflow level of the *sanitary fixture* it serves.

5.3 Diameter of vent pipes

5.3.1 *Fixture vent pipes, branch vent pipes, discharge stack vents* and *relief vents* shall have a *diameter* of no less than that given in Table 6.

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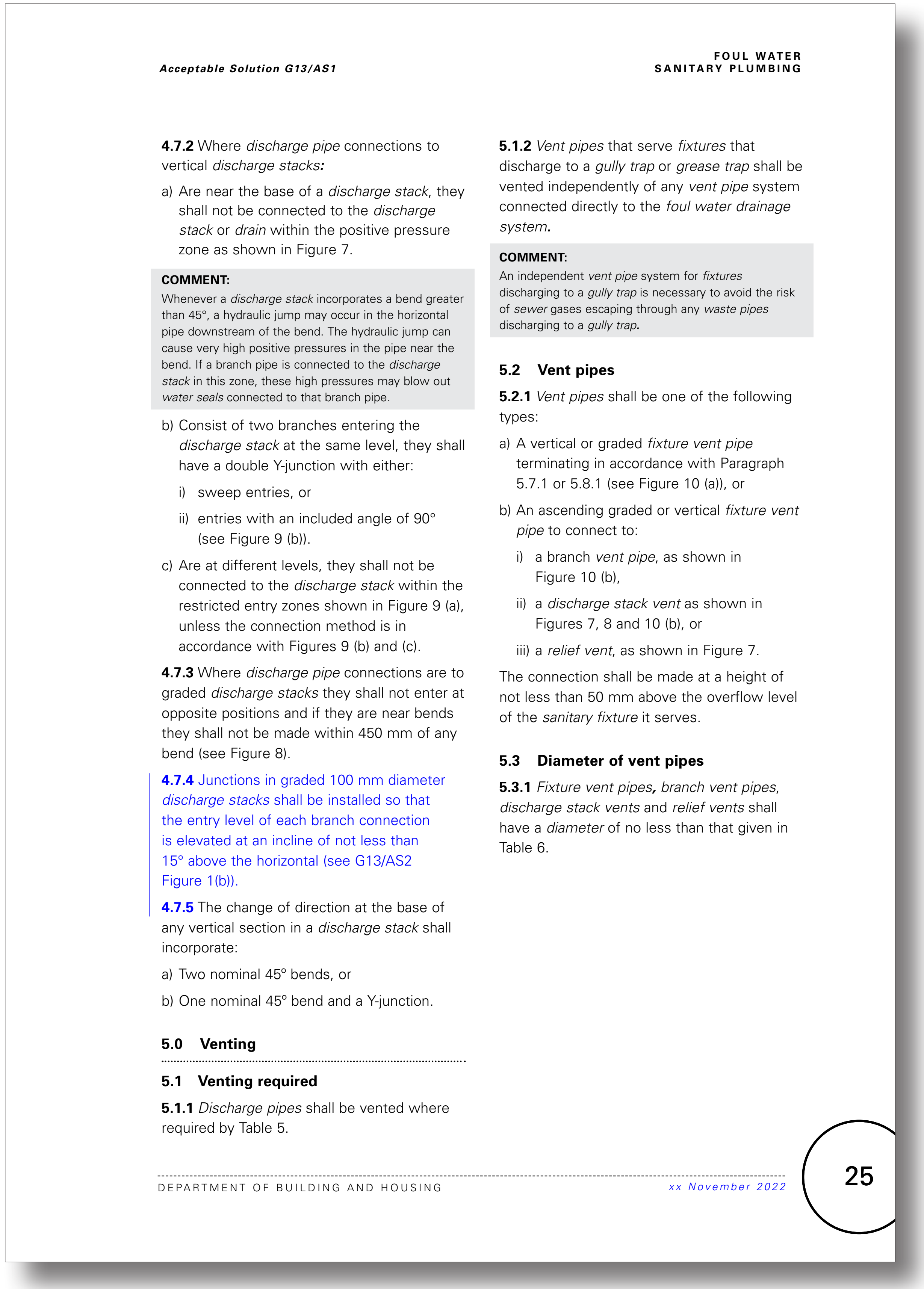

4.7.2 Where *discharge pipe* connections to vertical *discharge stacks:*

a) Are near the base of a *discharge stack*, they shall not be connected to the *discharge stack* or *drain* within the positive pressure zone as shown in Figure 7.

COMMENT:
Whenever a *discharge stack* incorporates a bend greater than 45°, a hydraulic jump may occur in the horizontal pipe downstream of the bend. The hydraulic jump can cause very high positive pressures in the pipe near the bend. If a branch pipe is connected to the *discharge stack* in this zone, these high pressures may blow out *water seals* connected to that branch pipe.

b) Consist of two branches entering the *discharge stack* at the same level, they shall have a double Y-junction with either:

i) sweep entries, or

ii) entries with an included angle of 90° (see Figure 9 (b)).

c) Are at different levels, they shall not be connected to the *discharge stack* within the restricted entry zones shown in Figure 9 (a), unless the connection method is in accordance with Figures 9 (b) and (c).

4.7.3 Where *discharge pipe* connections are to graded *discharge stacks* they shall not enter at opposite positions and if they are near bends they shall not be made within 450 mm of any bend (see Figure 8).

4.7.4 Junctions in graded 100 mm diameter *discharge stacks* shall be installed so that the entry level of each branch connection is elevated at an incline of not less than 15° above the horizontal (see G13/AS2 Figure 1(b)).

4.7.5 The change of direction at the base of any vertical section in a *discharge stack* shall incorporate:

a) Two nominal 45° bends, or

b) One nominal 45° bend and a Y-junction.

5.0 Venting

5.1 Venting required

5.1.1 *Discharge pipes* shall be vented where required by Table 5.

5.1.2 *Vent pipes* that serve *fixtures* that discharge to a *gully trap* or *grease trap* shall be vented independently of any *vent pipe* system connected directly to the *foul water drainage system.*

COMMENT:
An independent *vent pipe* system for *fixtures* discharging to a *gully trap* is necessary to avoid the risk of *sewer* gases escaping through any *waste pipes* discharging to a *gully trap.*

5.2 Vent pipes

5.2.1 *Vent pipes* shall be one of the following types:

a) A vertical or graded *fixture vent pipe* terminating in accordance with Paragraph 5.7.1 or 5.8.1 (see Figure 10 (a)), or

b) An ascending graded or vertical *fixture vent pipe* to connect to:

i) a branch *vent pipe*, as shown in Figure 10 (b),

ii) a *discharge stack vent* as shown in Figures 7, 8 and 10 (b), or

iii) a *relief vent*, as shown in Figure 7.

The connection shall be made at a height of not less than 50 mm above the overflow level of the *sanitary fixture* it serves.

5.3 Diameter of vent pipes

5.3.1 *Fixture vent pipes, branch vent pipes, discharge stack vents* and *relief vents* shall have a *diameter* of no less than that given in Table 6.

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Table 5: Venting requirements
Paragraphs 4.5.2, 4.6.2, 5.1.1, 5.5.1, 5.5.2 and 5.8.1

Stacks

Stack vent: All stacks discharging to another stack or to a *drain* require an open vent, sized in accordance with Table 6. Venting with an *air admittance valve* is permitted only on second and subsequent stacks as at least one open vent (the stack vent, if acting as main *drain* vent) is required to ventilate the *drain.*

Relief vent: All stacks that receive discharges from 3 floor levels shall be vented with a *relief vent* sized in accordance with Table 6. *Relief vents* shall be open vented.

Fixtures connected to a stack

All connections to a stack, except the highest connection, require venting by either an open vent, or an *air admittance valve,* sized in accordance with Table 6.

Highest fixture connected to a stack

The individual highest connection to a stack requires venting by either an open vent, or an *air admittance valve,* sized in accordance with Table 6, if the *discharge pipe* is longer than:

– 6 m for 100 mm pipe,

– 1.5 m for 80 mm pipe, and

– 3.5 m for 65 to 32 mm pipes.

Soil fixtures connected to an unvented branch drain

All *soil fixtures* connected to an unvented branch *drain* require venting by either an open vent, or an *air admittance valve,* sized in accordance with Table 6.

Soil fixtures connected to a vented drain with a gradient of less then 1:60

All *soil fixtures* connected to a vented *drain,* where the branch and the vented *drain* are at a gradient of less than 1:60, require venting by either an open vent, or an *air admittance valve* sized in accordance with Table 6.

Individual soil fixtures connected to a vented drain with a gradient of 1:60 or steeper

Individual *soil fixtures* connected to a vented *drain,* where the branch and the vented *drain* are at a gradient of 1:60 or steeper, require venting by either an open vent, or an *air admittance valve,* sized in accordance with Table 6, if the *discharge pipe* is longer than:

– 6 m for 100 mm pipe, or includes a vertical drop greater than 2 m, and

– 1.5 m for 80 mm pipe *diameters.*

Fixtures discharging to a gully trap

1. *Fixtures* connected to a combined *waste pipe* require venting by either an open vent, or an *air admittance valve,* sized in accordance with Table 6.
2. Individual *fixture discharge pipes* over 3.5 m in length require venting by either an open vent, or an *air admittance valve,* sized in accordance with Table 6.
3. Where any 32 mm *discharge pipe* has a vertical drop of greater than 1.5 m it shall be vented with a 32 mm vent pipe or an *air admittance valve.*

Venting of main drains

Main *drains* discharging to the *sewer* or to an on-site disposal system are required to be vented with a minimum 80 mm open vent.

Venting of branch drains

Branch *drains* connected to a vented *drain* that exceed 10 m in length require venting with an open vent, sized in accordance with Table 6.

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Table 5: Venting irements
Paragraphs 4.5.2, 4.6.2, 5.1.1, 5.5.1, 5.5.2 and 5.8.1

Stacks

Stack vent: All stacks discharging to another stack or to a *drain* require an open vent, sized in accordance with Table 6. Venting with an *air admittance valve* is permitted only on second and subsequent stacks as at least one open vent (the stack vent, if acting as main *drain* vent) is required to ventilate the *drain.*

Relief vent: All stacks that receive discharges from 3 floor levels shall be vented with a *relief vent* sized in accordance with Table 6. *Relief vents* shall be open vented.

Fixtures connected to a stack

All connections to a stack, except the highest connection, require venting by either an open vent, or an *air admittance valve,* sized in accordance with Table 6.

Highest fixture connected to a stack

The individual highest connection to a stack requires venting by either an open vent, or an *air admittance valve,* sized in accordance with Table 6, if the *discharge pipe* is longer than:

– 6 m for 100 mm pipe,

– 1.5 m for 80 mm pipe, and

– 3.5 m for 65 to 32 mm pipes.

Soil fixtures connected to an unvented branch drain

All *soil fixtures* connected to an unvented branch *drain* require venting by either an open vent, or an *air admittance valve,* sized in accordance with Table 6.

Soil fixtures connected to a vented drain with a gradient of less then 1:60

All *soil fixtures* connected to a vented *drain,* where the branch and the vented *drain* are at a gradient of less than 1:60, require venting by either an open vent, or an *air admittance valve* sized in accordance with Table 6.

Individual soil fixtures connected to a vented drain with a gradient of 1:60 or steeper

Individual *soil fixtures* connected to a vented *drain,* where the branch and the vented *drain* are at a gradient of 1:60 or steeper, require venting by either an open vent, or an *air admittance valve,* sized in accordance with Table 6, if the *discharge pipe* is longer than:

– 6 m for 100 mm pipe, or includes a vertical drop greater than 2 m, and

– 1.5 m for 80 mm pipe *diameters.*

Fixtures discharging to a gully trap

1. *Fixtures* connected to a combined *waste pipe* require venting by either an open vent, or an *air admittance valve,* sized in accordance with Table 6.
2. Individual *fixture discharge pipes* over 3.5 m in length require venting by either an open vent, or an *air admittance valve,* sized in accordance with Table 6.
3. Where any 32 mm *discharge pipe* has a vertical drop of greater than 1.5 m it shall be vented with a 32 mm vent pipe or an *air admittance valve.*

Venting of main drains

Main *drains* discharging to the *sewer* or to an on-site disposal system are required to be vented with a minimum 80 mm open vent.

Venting of branch drains

Branch *drains* connected to a vented *drain* that exceed 10 m in length require venting with an open vent, sized in accordance with Table 6.

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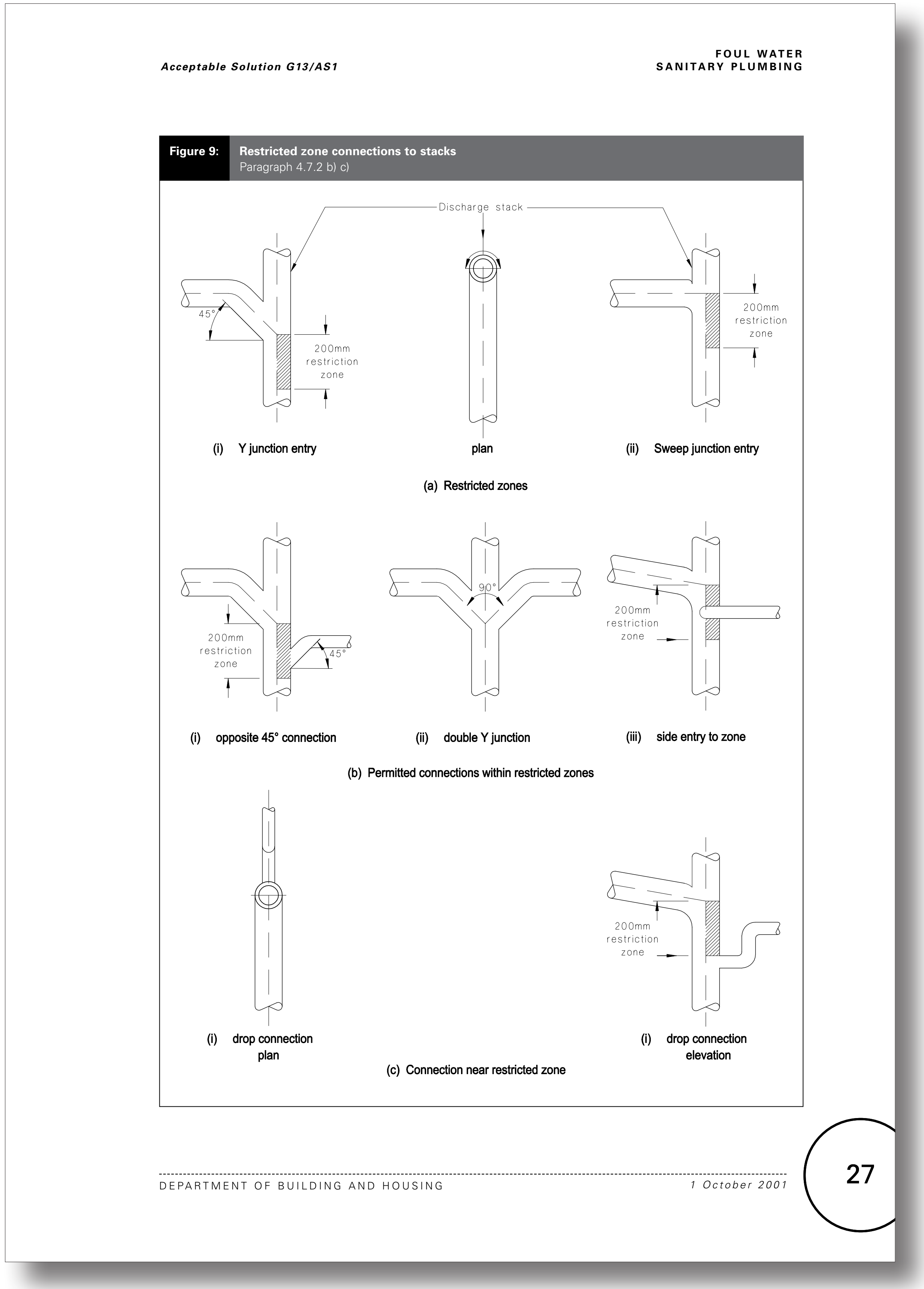

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Figure 9: **Restricted zone connections to stacks**
Paragraph 4.7.2 b) c)

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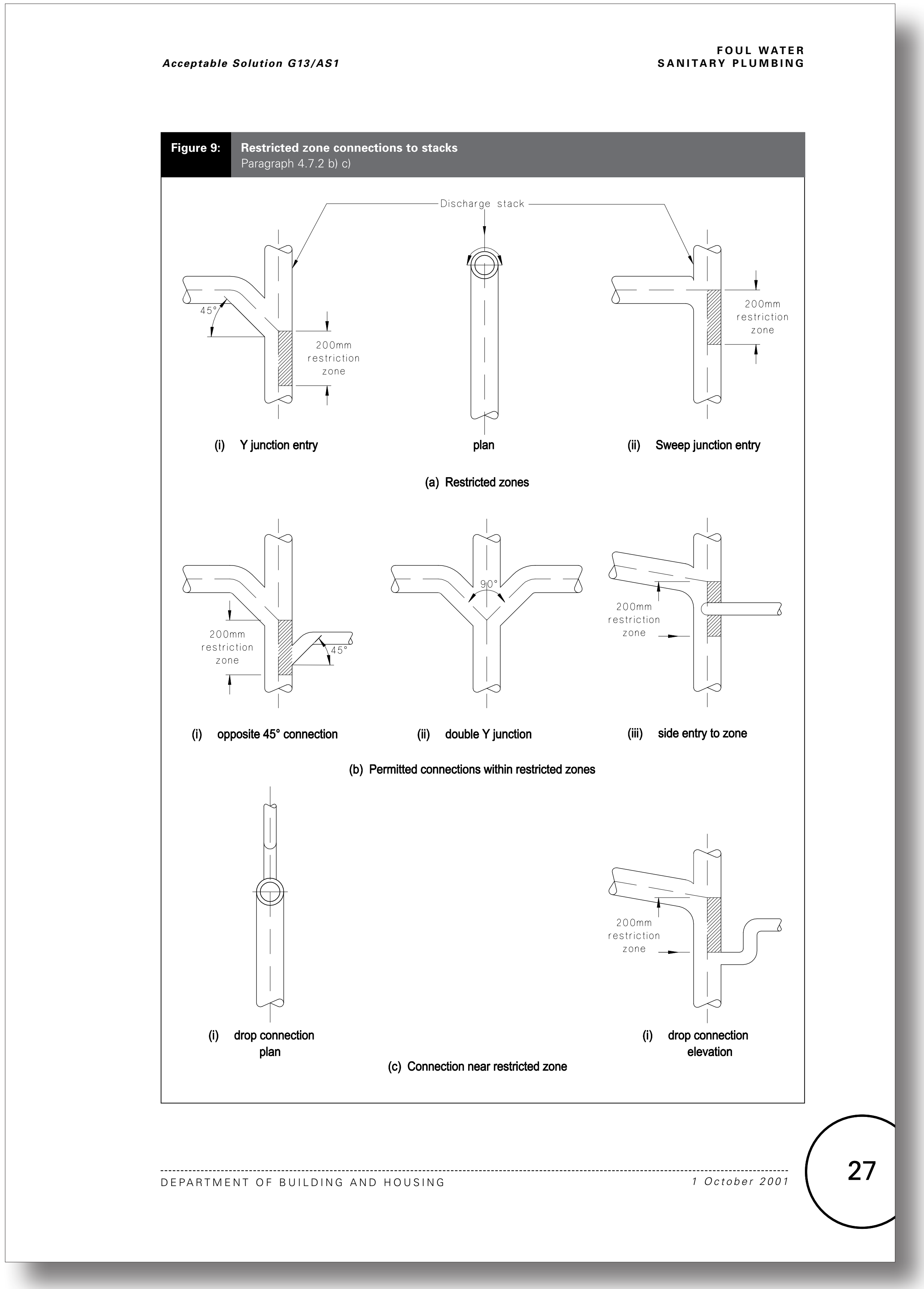

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Figure 9: **Restricted zone connections to stacks**
Paragraph 4.7.2 b) c)

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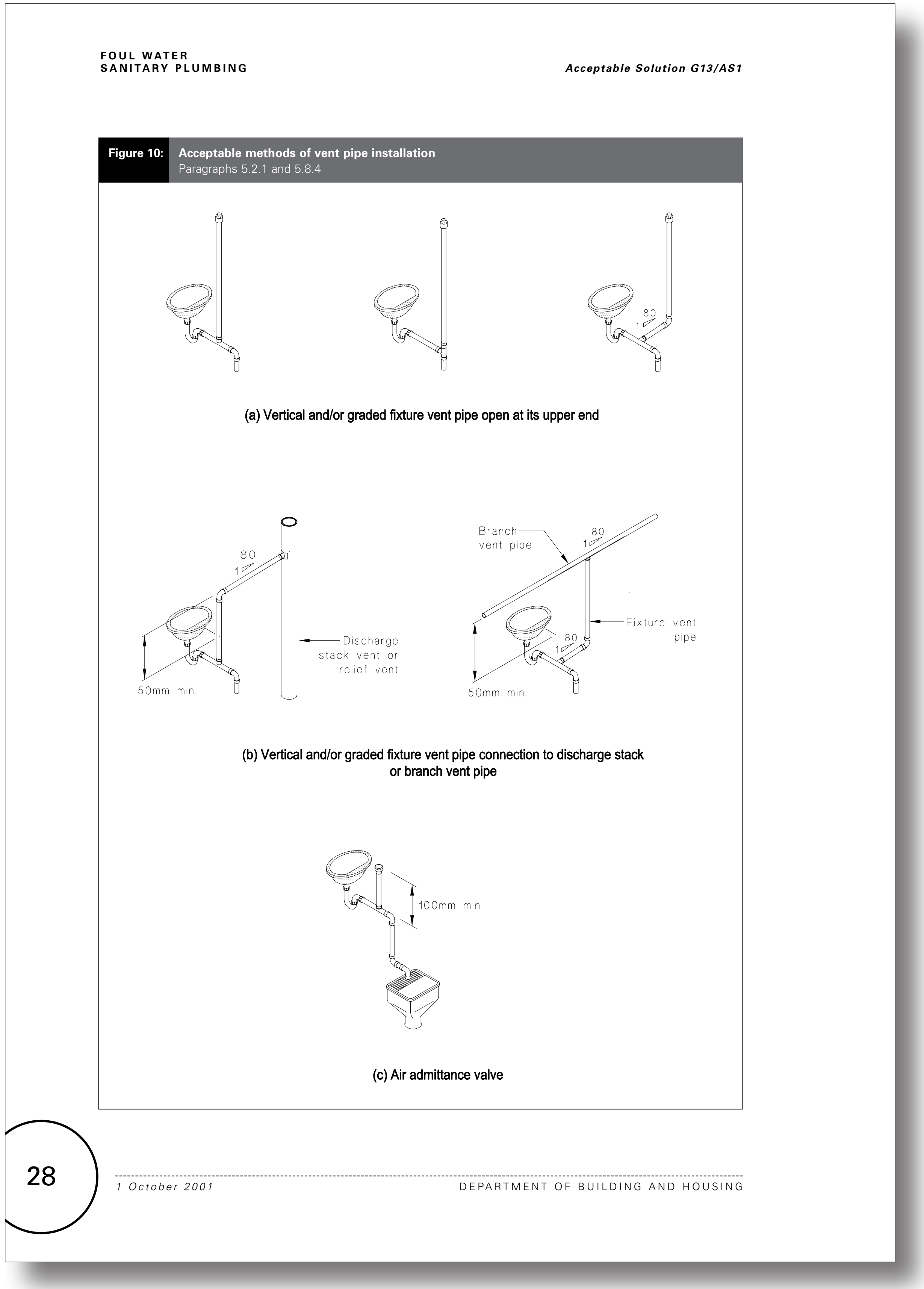

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Figure 10: **Acceptable methods of vent pipe installation**
Paragraphs 5.2.1 and 5.8.4

(a) Vertical and/or graded fixture vent pipe open at its upper end

(b) Vertical and/or graded fixture vent pipe connection to discharge stack or branch vent pipe

(c) Air admittance valve

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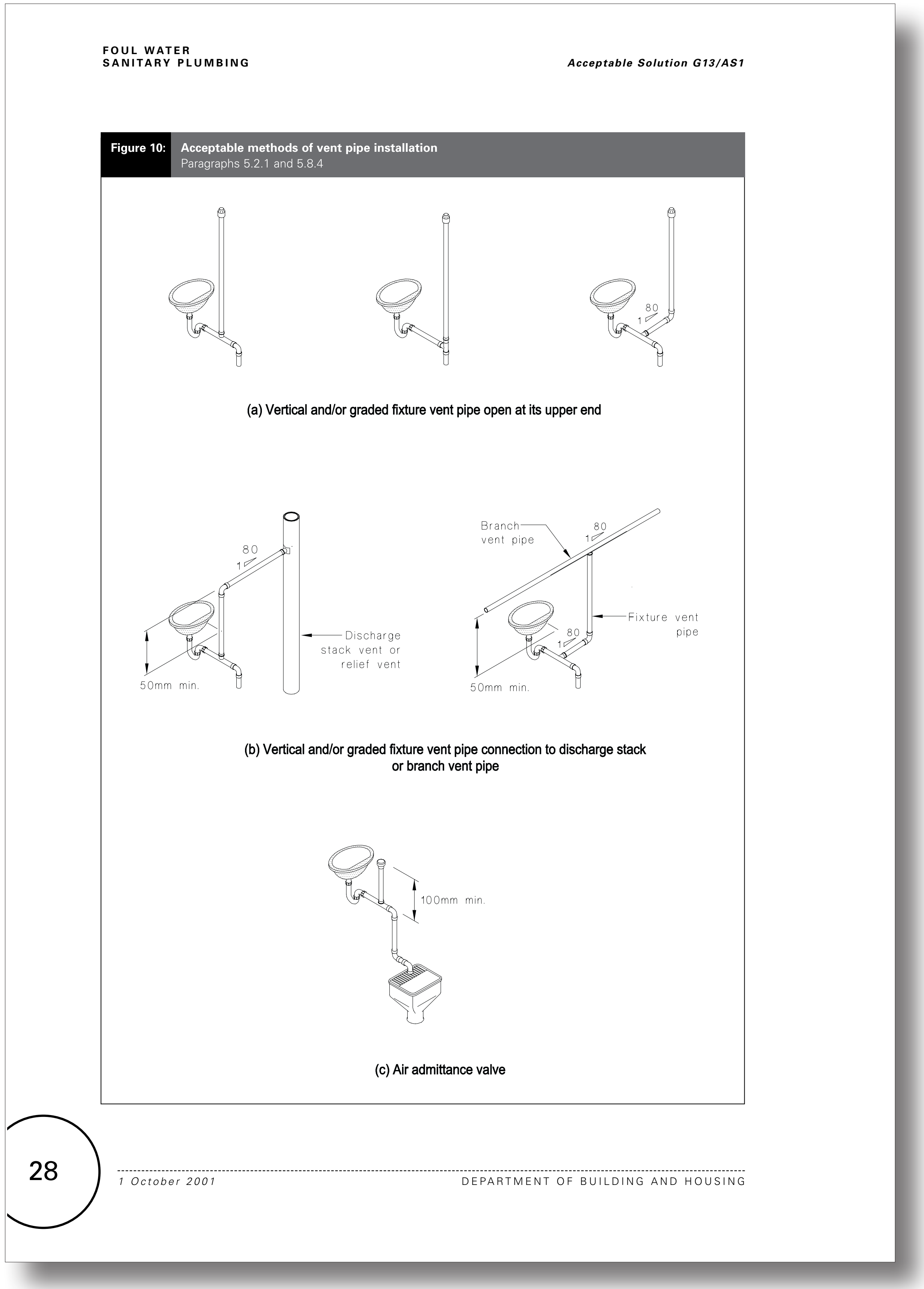
FOUL WATER
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Figure 10: **Acceptable methods of vent pipe installation**
Paragraphs 5.2.1 and 5.8.4

(a) Vertical and/or graded fixture vent pipe open at its upper end

(b) Vertical and/or graded fixture vent pipe connection to discharge stack or branch vent pipe

(c) Air admittance valve

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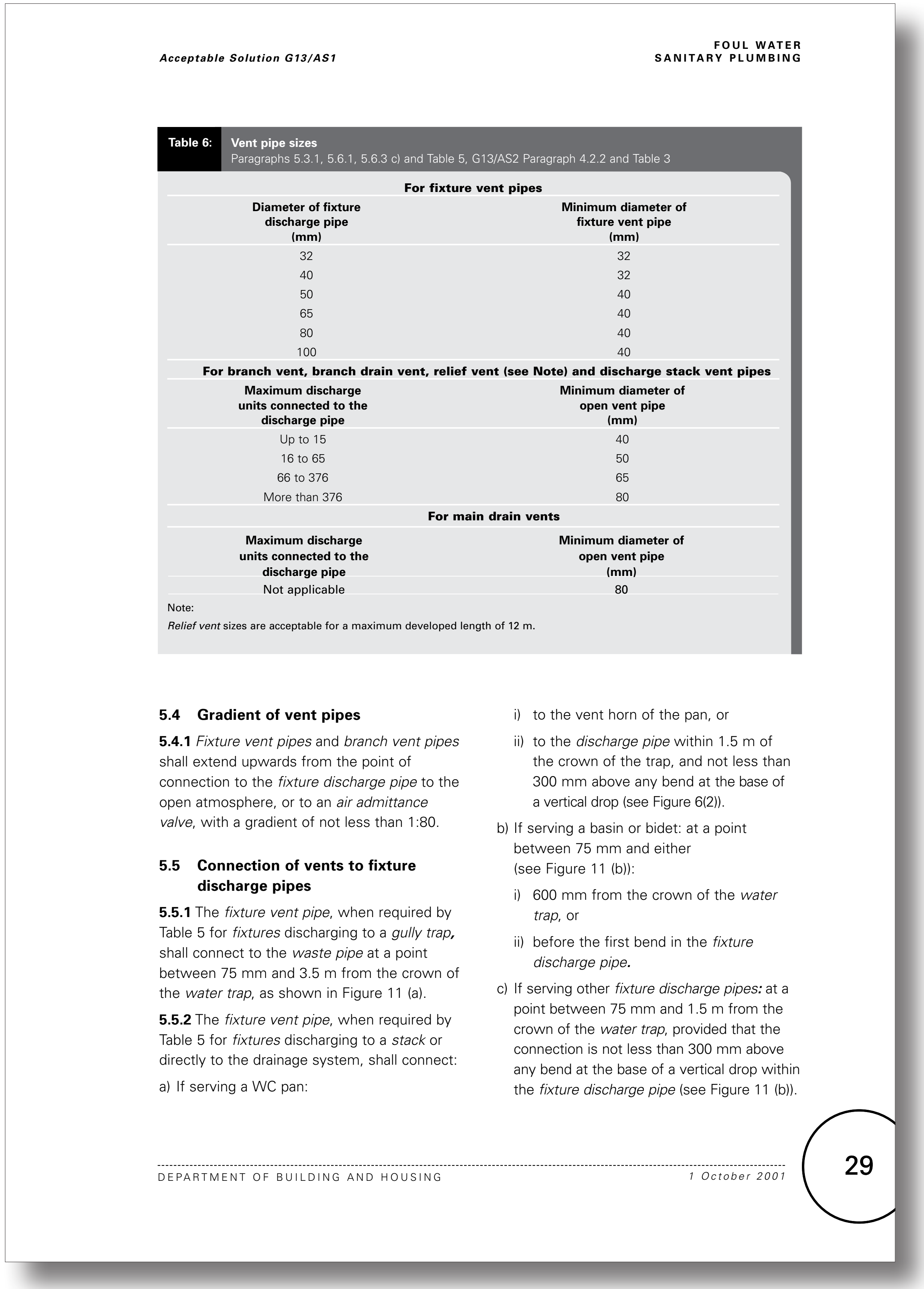

Table 6: **Vent pipe sizes**
Paragraphs 5.3.1, 5.6.1, 5.6.3 c) and Table 5, G13/AS2 Paragraph 4.2.2 and Table 3

For fixture vent pipes	
Diameter of fixture discharge pipe (mm)	**Minimum diameter of fixture vent pipe (mm)**
32	32
40	32
50	40
65	40
80	40
100	40
For branch vent, branch drain vent, relief vent (see Note) and discharge stack vent pipes	
Maximum discharge units connected to the discharge pipe	**Minimum diameter of open vent pipe (mm)**
Up to 15	40
16 to 65	50
66 to 376	65
More than 376	80
For main drain vents	
Maximum discharge units connected to the discharge pipe	**Minimum diameter of open vent pipe (mm)**
Not applicable	80

Note:
Relief vent sizes are acceptable for a maximum developed length of 12 m.

5.4 Gradient of vent pipes

5.4.1 *Fixture vent pipes* and *branch vent pipes* shall extend upwards from the point of connection to the *fixture discharge pipe* to the open atmosphere, or to an *air admittance valve*, with a gradient of not less than 1:80.

5.5 Connection of vents to fixture discharge pipes

5.5.1 The *fixture vent pipe*, when required by Table 5 for *fixtures* discharging to a *gully trap*, shall connect to the *waste pipe* at a point between 75 mm and 3.5 m from the crown of the *water trap*, as shown in Figure 11 (a).

5.5.2 The *fixture vent pipe*, when required by Table 5 for *fixtures* discharging to a *stack* or directly to the drainage system, shall connect:

a) If serving a WC pan:
   i) to the vent horn of the pan, or
   ii) to the *discharge pipe* within 1.5 m of the crown of the trap, and not less than 300 mm above any bend at the base of a vertical drop (see Figure 6(2)).

b) If serving a basin or bidet: at a point between 75 mm and either (see Figure 11 (b)):
   i) 600 mm from the crown of the *water trap*, or
   ii) before the first bend in the *fixture discharge pipe*.

c) If serving other *fixture discharge pipes:* at a point between 75 mm and 1.5 m from the crown of the *water trap*, provided that the connection is not less than 300 mm above any bend at the base of a vertical drop within the *fixture discharge pipe* (see Figure 11 (b)).

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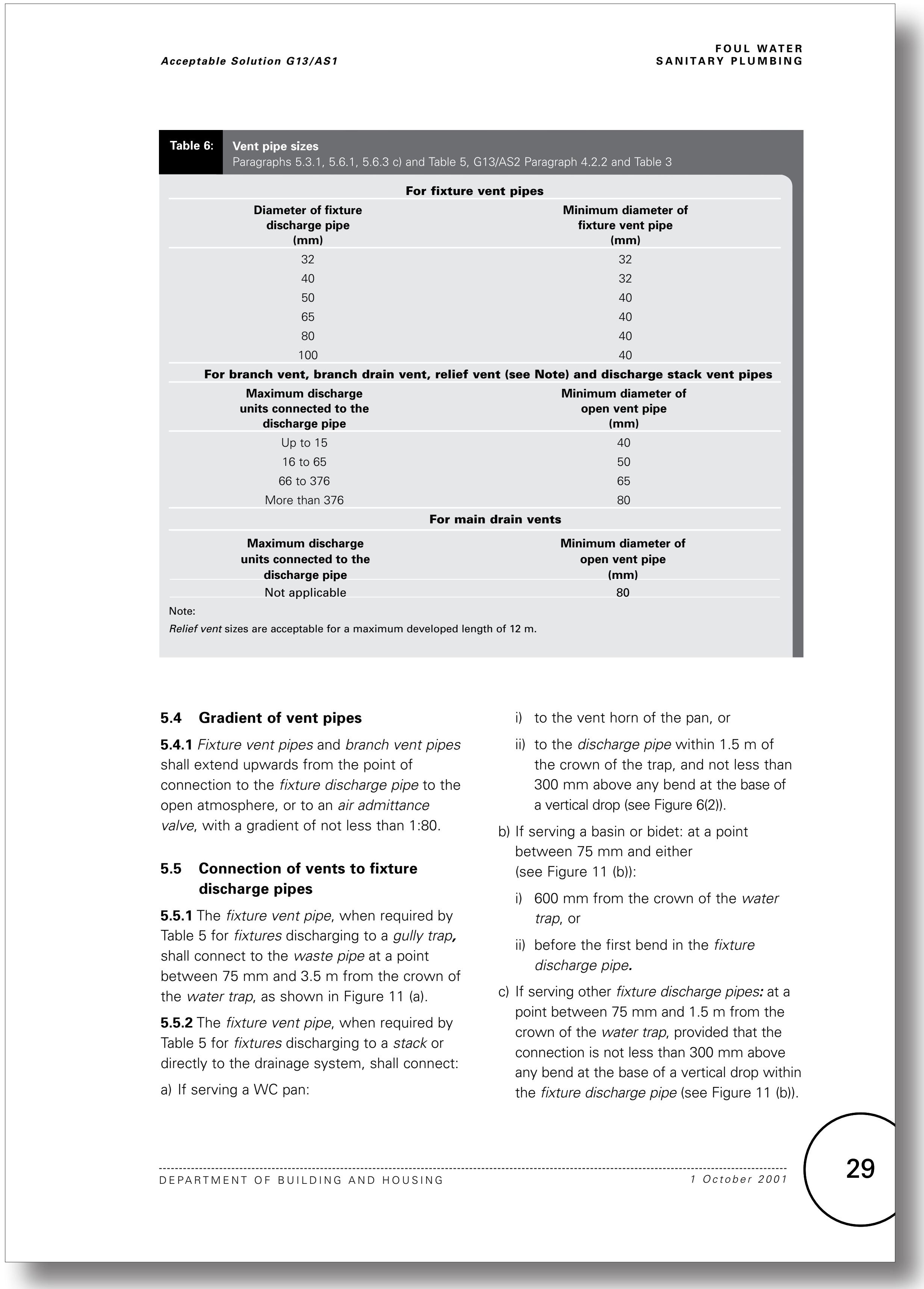

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Table 6: **Vent pipe sizes**
Paragraphs 5.3.1, 5.6.1, 5.6.3 c) and Table 5, G13/AS2 Paragraph 4.2.2 and Table 3

For fixture vent pipes	
Diameter of fixture discharge pipe (mm)	**Minimum diameter of fixture vent pipe (mm)**
32	32
40	32
50	40
65	40
80	40
100	40
For branch vent, branch drain vent, relief vent (see Note) and discharge stack vent pipes	
Maximum discharge units connected to the discharge pipe	**Minimum diameter of open vent pipe (mm)**
Up to 15	40
16 to 65	50
66 to 376	65
More than 376	80
For main drain vents	
Maximum discharge units connected to the discharge pipe	**Minimum diameter of open vent pipe (mm)**
Not applicable	80

Note:
Relief vent sizes are acceptable for a maximum developed length of 12 m.

5.4 Gradient of vent pipes

5.4.1 *Fixture vent pipes* and *branch vent pipes* shall extend upwards from the point of connection to the *fixture discharge pipe* to the open atmosphere, or to an *air admittance valve*, with a gradient of not less than 1:80.

5.5 Connection of vents to fixture discharge pipes

5.5.1 The *fixture vent pipe*, when required by Table 5 for *fixtures* discharging to a *gully trap*, shall connect to the *waste pipe* at a point between 75 mm and 3.5 m from the crown of the *water trap*, as shown in Figure 11 (a).

5.5.2 The *fixture vent pipe*, when required by Table 5 for *fixtures* discharging to a *stack* or directly to the drainage system, shall connect:

a) If serving a WC pan:
   i) to the vent horn of the pan, or
   ii) to the *discharge pipe* within 1.5 m of the crown of the trap, and not less than 300 mm above any bend at the base of a vertical drop (see Figure 6(2)).

b) If serving a basin or bidet: at a point between 75 mm and either (see Figure 11 (b)):
   i) 600 mm from the crown of the *water trap*, or
   ii) before the first bend in the *fixture discharge pipe*.

c) If serving other *fixture discharge pipes:* at a point between 75 mm and 1.5 m from the crown of the *water trap*, provided that the connection is not less than 300 mm above any bend at the base of a vertical drop within the *fixture discharge pipe* (see Figure 11 (b)).

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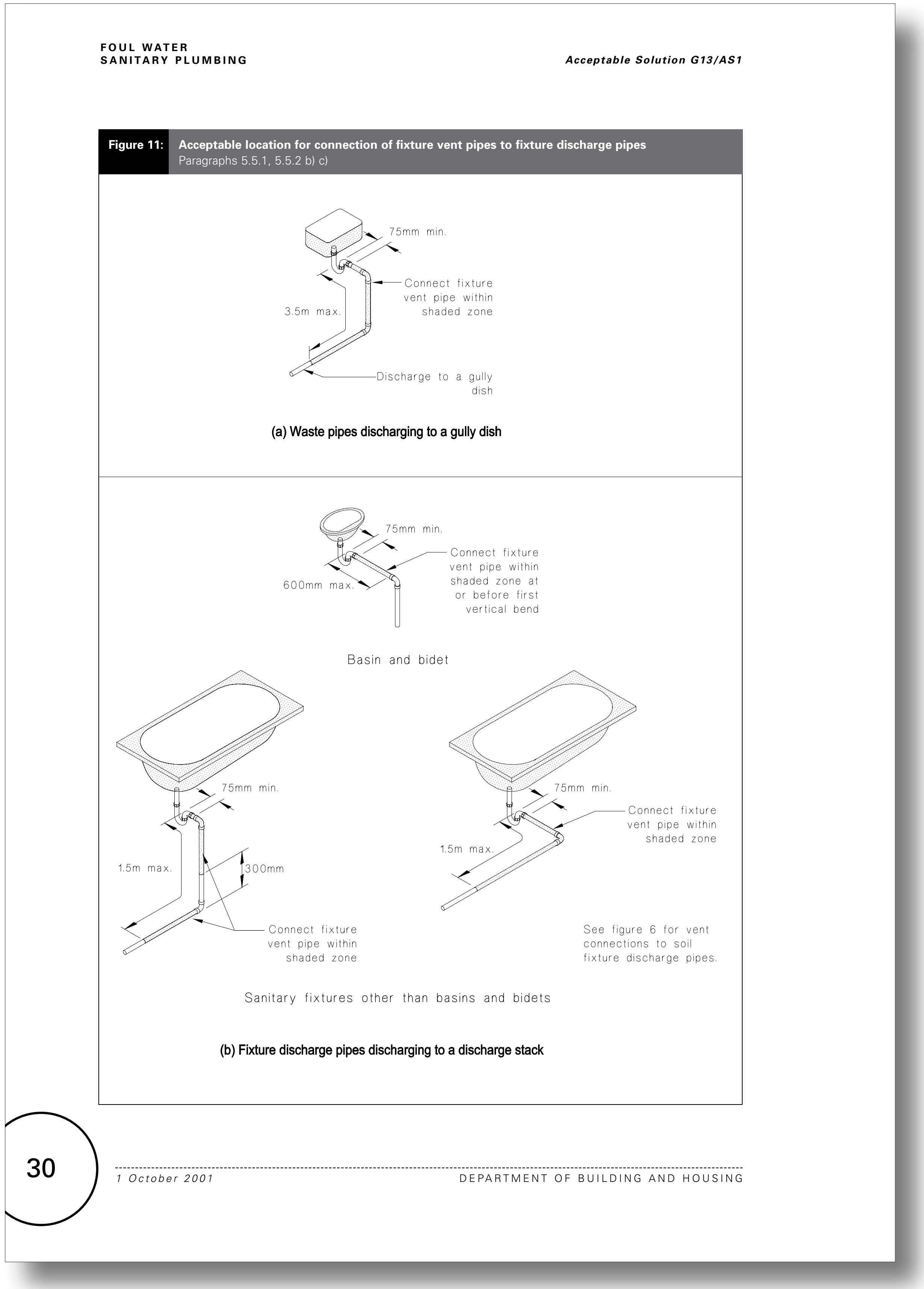

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Figure 11: **Acceptable location for connection of fixture vent pipes to fixture discharge pipes**
Paragraphs 5.5.1, 5.5.2 b) c)

(a) Waste pipes discharging to a gully dish

(b) Fixture discharge pipes discharging to a discharge stack

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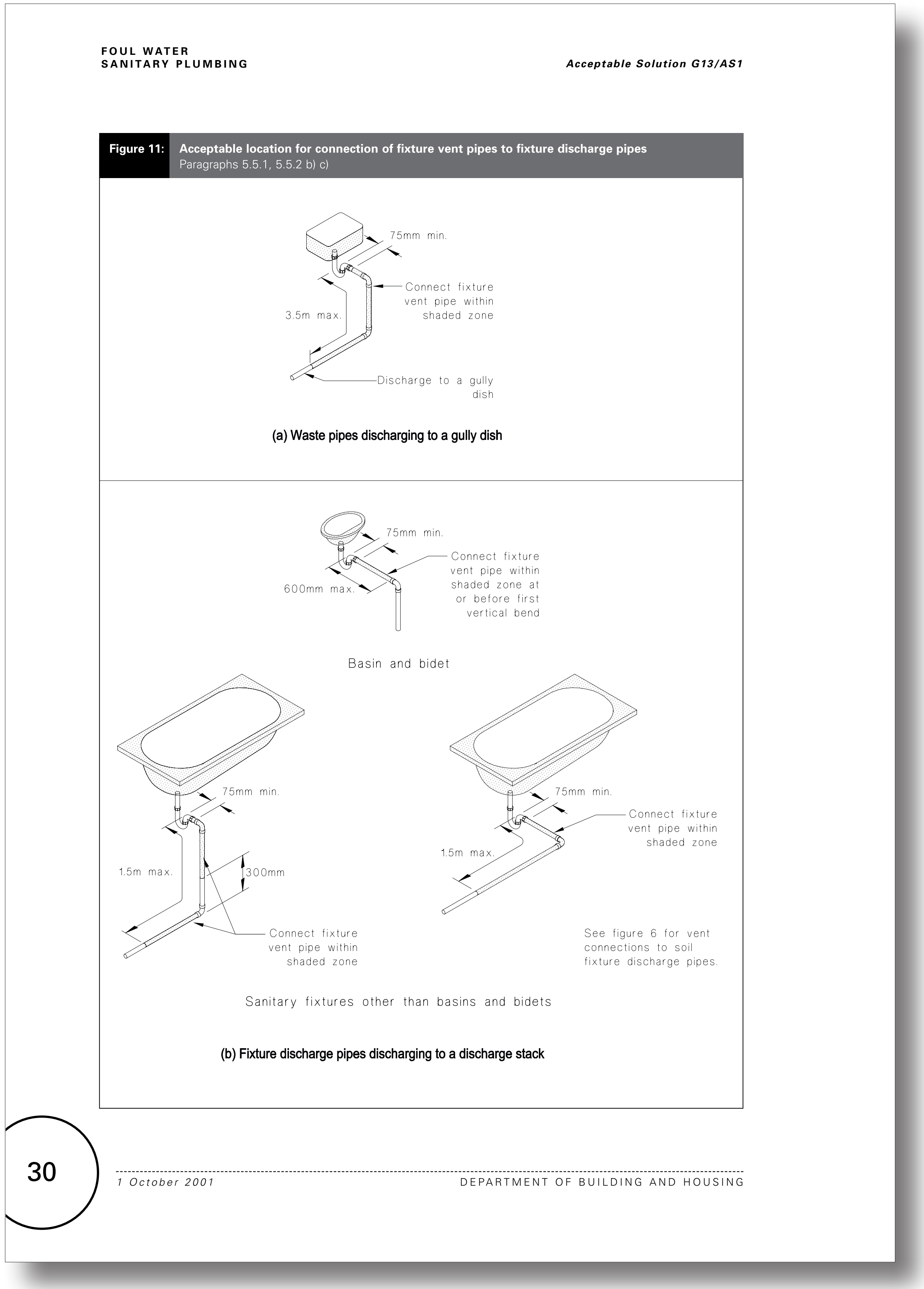

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Figure 11: **Acceptable location for connection of fixture vent pipes to fixture discharge pipes**
Paragraphs 5.5.1, 5.5.2 b) c)

(a) Waste pipes discharging to a gully dish

(b) Fixture discharge pipes discharging to a discharge stack

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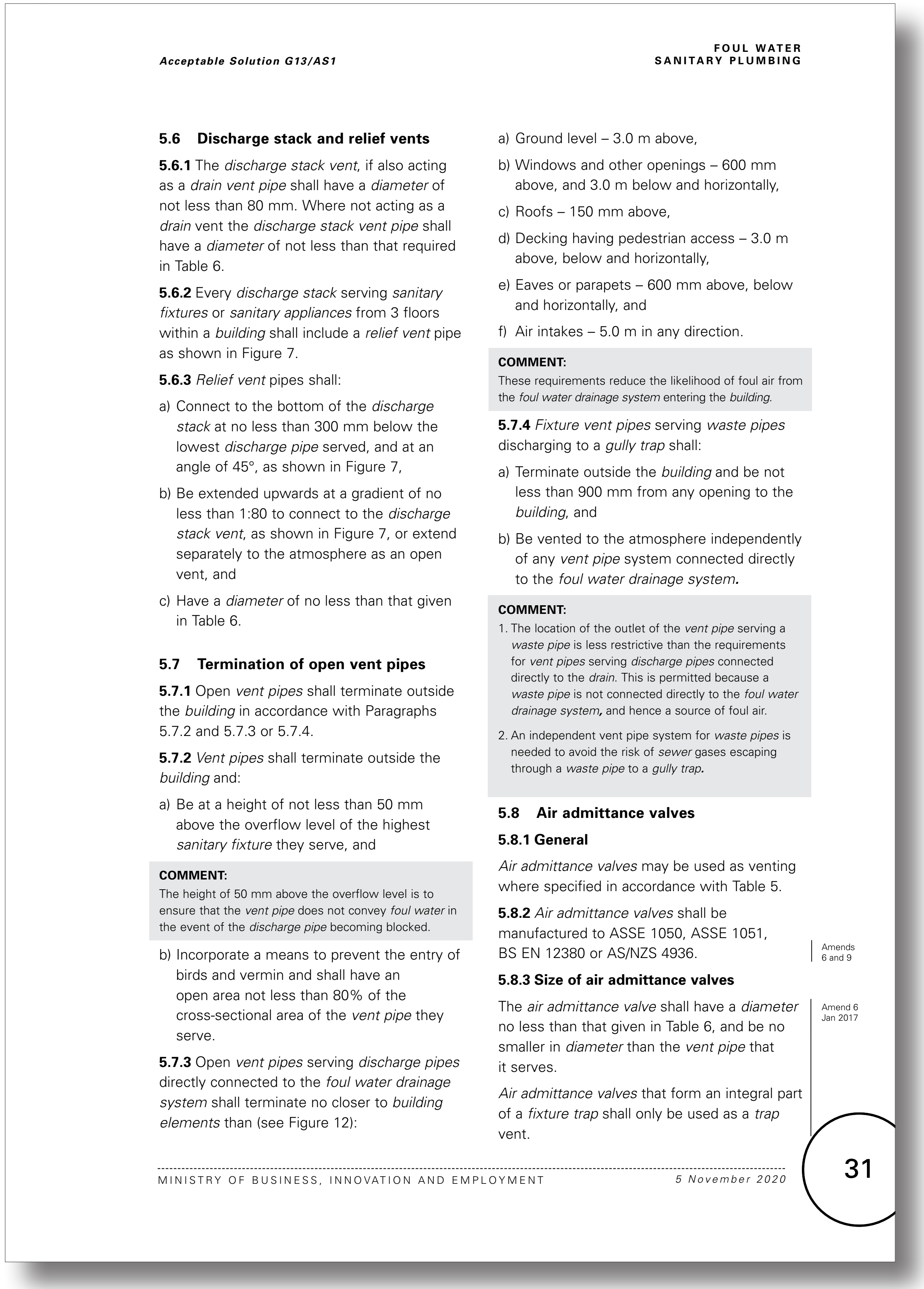

5.6 Discharge stack and relief vents

5.6.1 The *discharge stack vent*, if also acting as a *drain vent pipe* shall have a *diameter* of not less than 80 mm. Where not acting as a *drain* vent the *discharge stack vent pipe* shall have a *diameter* of not less than that required in Table 6.

5.6.2 Every *discharge stack* serving *sanitary fixtures* or *sanitary appliances* from 3 floors within a *building* shall include a *relief vent* pipe as shown in Figure 7.

5.6.3 *Relief vent* pipes shall:

a) Connect to the bottom of the *discharge stack* at no less than 300 mm below the lowest *discharge pipe* served, and at an angle of 45°, as shown in Figure 7,

b) Be extended upwards at a gradient of no less than 1:80 to connect to the *discharge stack vent*, as shown in Figure 7, or extend separately to the atmosphere as an open vent, and

c) Have a *diameter* of no less than that given in Table 6.

5.7 Termination of open vent pipes

5.7.1 Open *vent pipes* shall terminate outside the *building* in accordance with Paragraphs 5.7.2 and 5.7.3 or 5.7.4.

5.7.2 *Vent pipes* shall terminate outside the *building* and:

a) Be at a height of not less than 50 mm above the overflow level of the highest *sanitary fixture* they serve, and

COMMENT:
The height of 50 mm above the overflow level is to ensure that the *vent pipe* does not convey *foul water* in the event of the *discharge pipe* becoming blocked.

b) Incorporate a means to prevent the entry of birds and vermin and shall have an open area not less than 80% of the cross-sectional area of the *vent pipe* they serve.

5.7.3 Open *vent pipes* serving *discharge pipes* directly connected to the *foul water drainage system* shall terminate no closer to *building elements* than (see Figure 12):

a) Ground level – 3.0 m above,

b) Windows and other openings – 600 mm above, and 3.0 m below and horizontally,

c) Roofs – 150 mm above,

d) Decking having pedestrian access – 3.0 m above, below and horizontally,

e) Eaves or parapets – 600 mm above, below and horizontally, and

f) Air intakes – 5.0 m in any direction.

COMMENT:
These requirements reduce the likelihood of foul air from the *foul water drainage system* entering the *building.*

5.7.4 *Fixture vent pipes* serving *waste pipes* discharging to a *gully trap* shall:

a) Terminate outside the *building* and be not less than 900 mm from any opening to the *building*, and

b) Be vented to the atmosphere independently of any *vent pipe* system connected directly to the *foul water drainage system.*

COMMENT:
1. The location of the outlet of the *vent pipe* serving a *waste pipe* is less restrictive than the requirements for *vent pipes* serving *discharge pipes* connected directly to the *drain*. This is permitted because a *waste pipe* is not connected directly to the *foul water drainage system*, and hence a source of foul air.
2. An independent vent pipe system for *waste pipes* is needed to avoid the risk of *sewer* gases escaping through a *waste pipe* to a *gully trap.*

5.8 Air admittance valves

5.8.1 General

Air admittance valves may be used as venting where specified in accordance with Table 5.

5.8.2 *Air admittance valves* shall be manufactured to ASSE 1050, ASSE 1051, BS EN 12380 or AS/NZS 4936. Amends 6 and 9

5.8.3 Size of air admittance valves

The *air admittance valve* shall have a *diameter* no less than that given in Table 6, and be no smaller in *diameter* than the *vent pipe* that it serves. Amend 6 Jan 2017

Air admittance valves that form an integral part of a *fixture trap* shall only be used as a *trap* vent.

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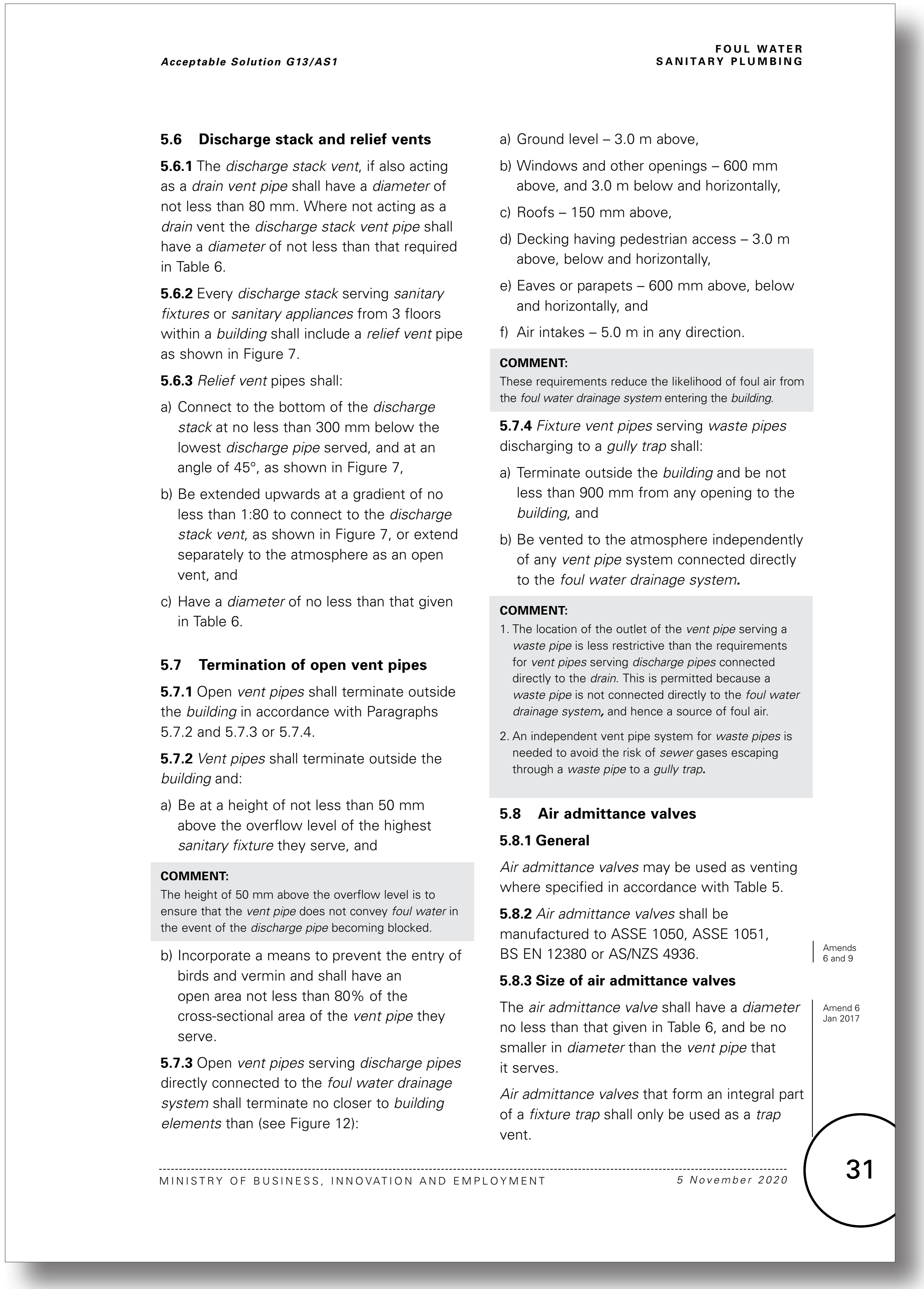

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5.6 Discharge stack and relief vents

5.6.1 The *discharge stack vent*, if also acting as a *drain vent pipe* shall have a *diameter* of not less than 80 mm. Where not acting as a *drain* vent the *discharge stack vent pipe* shall have a *diameter* of not less than that required in Table 6.

5.6.2 Every *discharge stack* serving *sanitary fixtures* or *sanitary appliances* from 3 floors within a *building* shall include a *relief vent* pipe as shown in Figure 7.

5.6.3 *Relief vent* pipes shall:

a) Connect to the bottom of the *discharge stack* at no less than 300 mm below the lowest *discharge pipe* served, and at an angle of 45°, as shown in Figure 7,

b) Be extended upwards at a gradient of no less than 1:80 to connect to the *discharge stack vent*, as shown in Figure 7, or extend separately to the atmosphere as an open vent, and

c) Have a *diameter* of no less than that given in Table 6.

5.7 Termination of open vent pipes

5.7.1 Open *vent pipes* shall terminate outside the *building* in accordance with Paragraphs 5.7.2 and 5.7.3 or 5.7.4.

5.7.2 *Vent pipes* shall terminate outside the *building* and:

a) Be at a height of not less than 50 mm above the overflow level of the highest *sanitary fixture* they serve, and

COMMENT:
The height of 50 mm above the overflow level is to ensure that the *vent pipe* does not convey *foul water* in the event of the *discharge pipe* becoming blocked.

b) Incorporate a means to prevent the entry of birds and vermin and shall have an open area not less than 80% of the cross-sectional area of the *vent pipe* they serve.

5.7.3 Open *vent pipes* serving *discharge pipes* directly connected to the *foul water drainage system* shall terminate no closer to *building elements* than (see Figure 12):

a) Ground level – 3.0 m above,

b) Windows and other openings – 600 mm above, and 3.0 m below and horizontally,

c) Roofs – 150 mm above,

d) Decking having pedestrian access – 3.0 m above, below and horizontally,

e) Eaves or parapets – 600 mm above, below and horizontally, and

f) Air intakes – 5.0 m in any direction.

COMMENT:
These requirements reduce the likelihood of foul air from the *foul water drainage system* entering the *building.*

5.7.4 *Fixture vent pipes* serving *waste pipes* discharging to a *gully trap* shall:

a) Terminate outside the *building* and be not less than 900 mm from any opening to the *building*, and

b) Be vented to the atmosphere independently of any *vent pipe* system connected directly to the *foul water drainage system.*

COMMENT:
1. The location of the outlet of the *vent pipe* serving a *waste pipe* is less restrictive than the requirements for *vent pipes* serving *discharge pipes* connected directly to the *drain*. This is permitted because a *waste pipe* is not connected directly to the *foul water drainage system*, and hence a source of foul air.
2. An independent vent pipe system for *waste pipes* is needed to avoid the risk of *sewer* gases escaping through a *waste pipe* to a *gully trap.*

5.8 Air admittance valves

5.8.1 General

Air admittance valves may be used as venting where specified in accordance with Table 5.

5.8.2 *Air admittance valves* shall be manufactured to ASSE 1050, ASSE 1051, BS EN 12380 or AS/NZS 4936. Amends 6 and 9

5.8.3 Size of air admittance valves

The *air admittance valve* shall have a *diameter* no less than that given in Table 6, and be no smaller in *diameter* than the *vent pipe* that it serves. Amend 6 Jan 2017

Air admittance valves that form an integral part of a *fixture trap* shall only be used as a *trap* vent.

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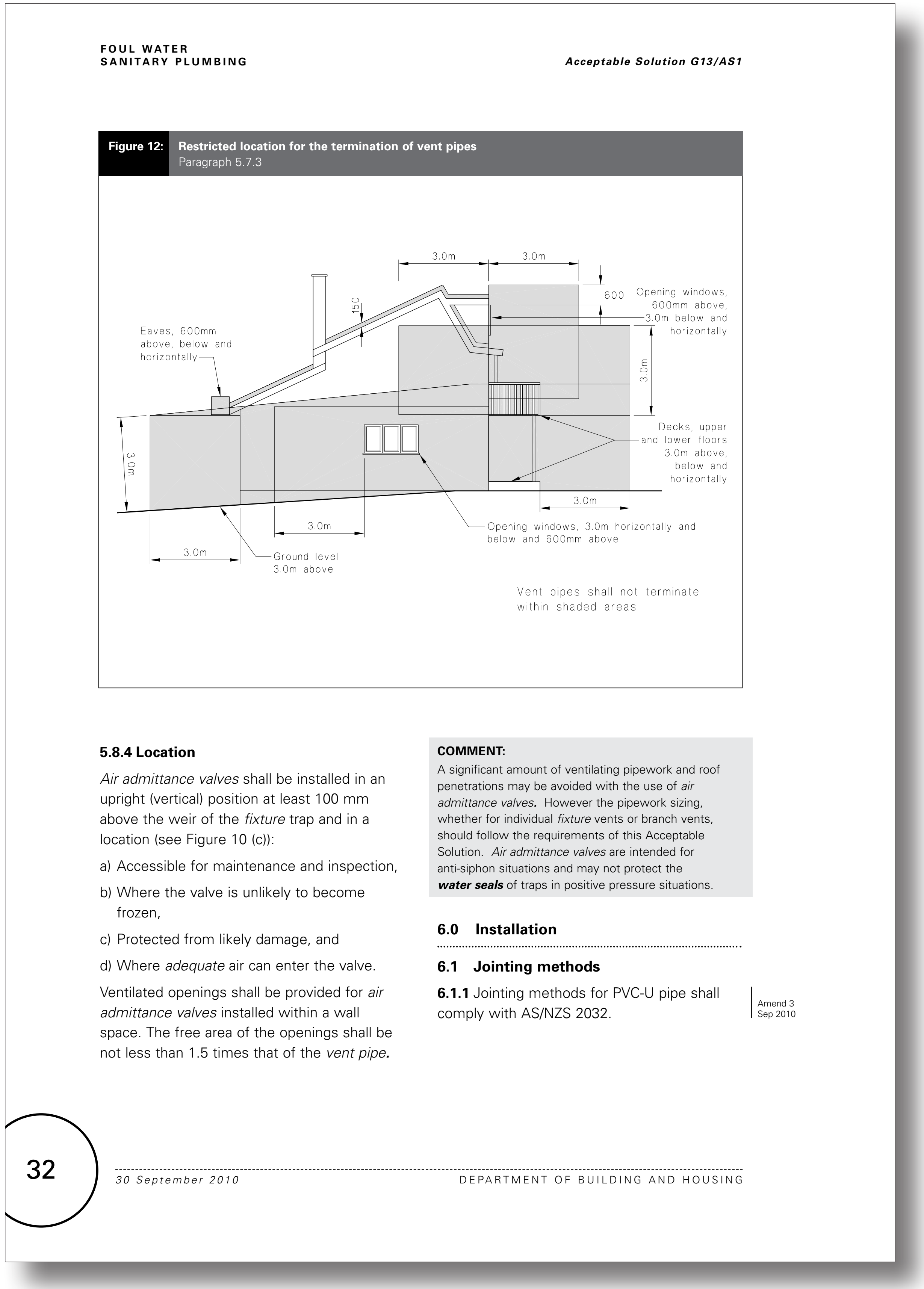

Figure 12: **Restricted location for the termination of vent pipes**
Paragraph 5.7.3

Vent pipes shall not terminate within shaded areas

5.8.4 Location

Air admittance valves shall be installed in an upright (vertical) position at least 100 mm above the weir of the *fixture* trap and in a location (see Figure 10 (c)):

a) Accessible for maintenance and inspection,

b) Where the valve is unlikely to become frozen,

c) Protected from likely damage, and

d) Where *adequate* air can enter the valve.

Ventilated openings shall be provided for *air admittance valves* installed within a wall space. The free area of the openings shall be not less than 1.5 times that of the *vent pipe.*

COMMENT:
A significant amount of ventilating pipework and roof penetrations may be avoided with the use of *air admittance valves.* However the pipework sizing, whether for individual *fixture* vents or branch vents, should follow the requirements of this Acceptable Solution. *Air admittance valves* are intended for anti-siphon situations and may not protect the ***water seals*** of traps in positive pressure situations.

6.0 Installation

6.1 Jointing methods

6.1.1 Jointing methods for PVC-U pipe shall comply with AS/NZS 2032.

Amend 3
Sep 2010

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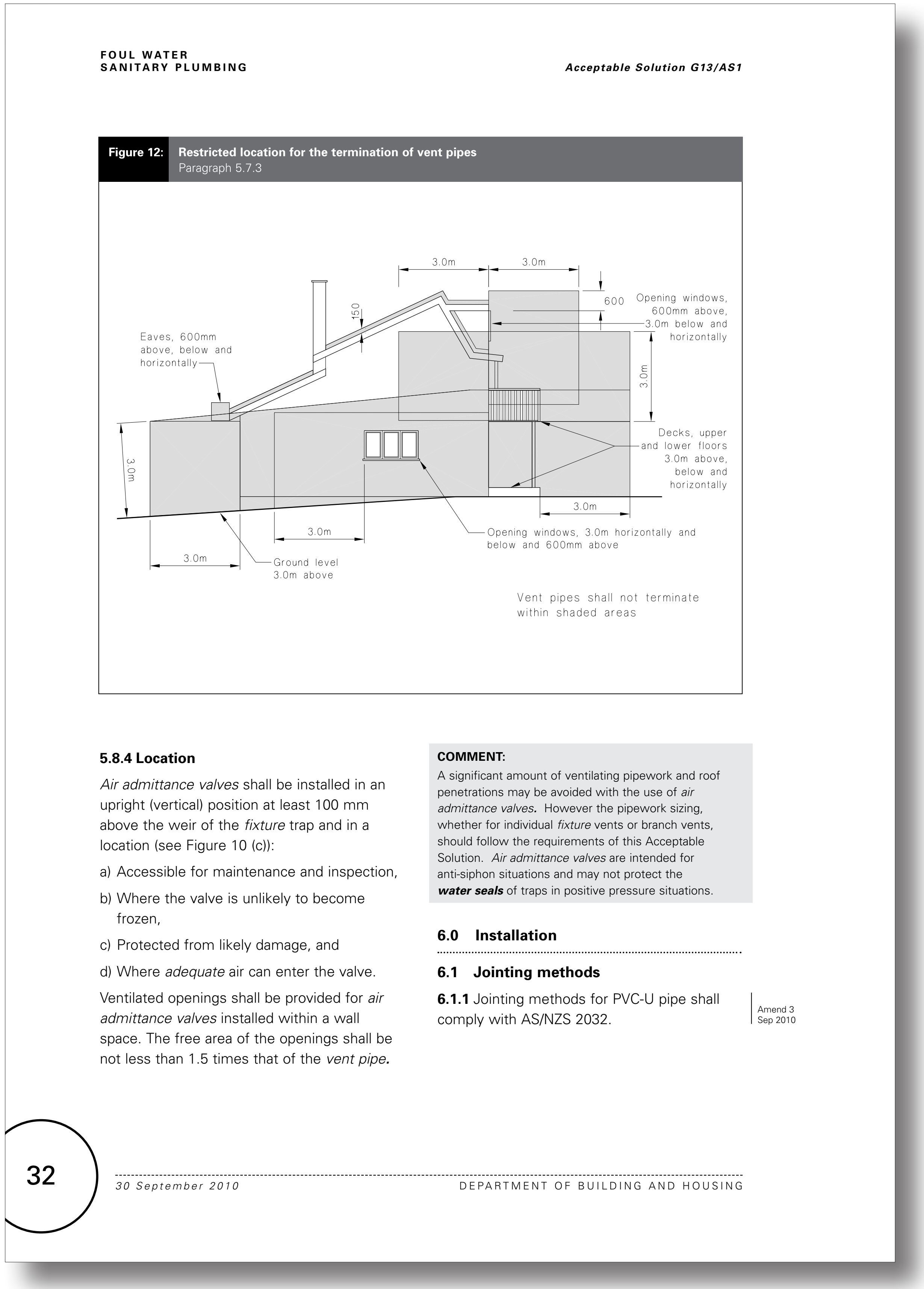

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Figure 12: **Restricted location for the termination of vent pipes**
Paragraph 5.7.3

Vent pipes shall not terminate within shaded areas

5.8.4 Location

Air admittance valves shall be installed in an upright (vertical) position at least 100 mm above the weir of the *fixture* trap and in a location (see Figure 10 (c)):

a) Accessible for maintenance and inspection,

b) Where the valve is unlikely to become frozen,

c) Protected from likely damage, and

d) Where *adequate* air can enter the valve.

Ventilated openings shall be provided for *air admittance valves* installed within a wall space. The free area of the openings shall be not less than 1.5 times that of the *vent pipe.*

COMMENT:
A significant amount of ventilating pipework and roof penetrations may be avoided with the use of *air admittance valves.* However the pipework sizing, whether for individual *fixture* vents or branch vents, should follow the requirements of this Acceptable Solution. *Air admittance valves* are intended for anti-siphon situations and may not protect the ***water seals*** of traps in positive pressure situations.

6.0 Installation

6.1 Jointing methods

6.1.1 Jointing methods for PVC-U pipe shall comply with AS/NZS 2032.

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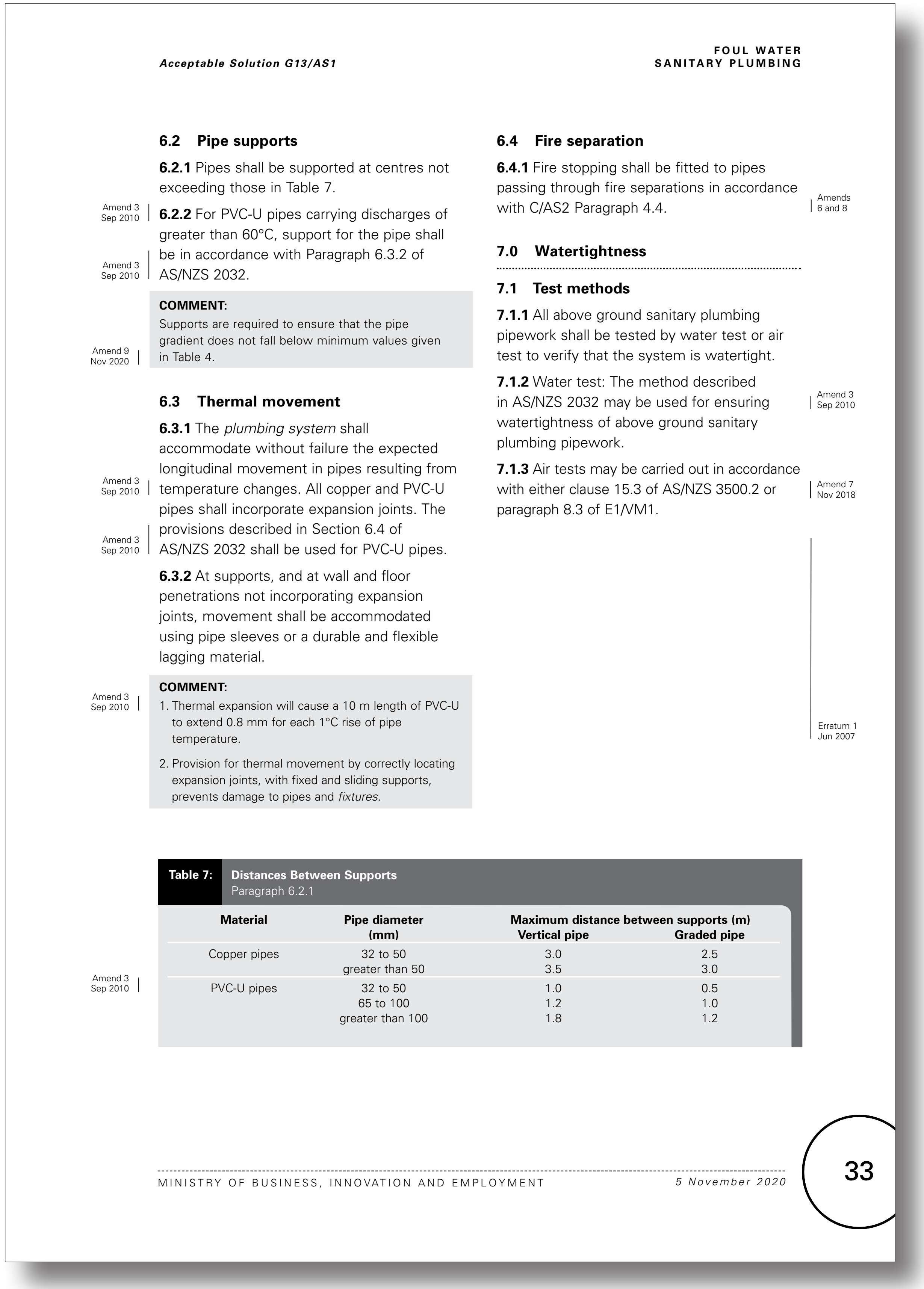
DEPARTMENT OF BUILDING AND HOUSING

Current G13 Foul Water - No changes proposed to this page



6.2 Pipe supports

6.2.1 Pipes shall be supported at centres not exceeding those in Table 7.

Amend 3 Sep 2010
Amend 3 Sep 2010

6.2.2 For PVC-U pipes carrying discharges of greater than 60°C, support for the pipe shall be in accordance with Paragraph 6.3.2 of AS/NZS 2032.

Amend 9 Nov 2020

COMMENT:
Supports are required to ensure that the pipe gradient does not fall below minimum values given in Table 4.

6.3 Thermal movement

Amend 3 Sep 2010
Amend 3 Sep 2010

6.3.1 The *plumbing system* shall accommodate without failure the expected longitudinal movement in pipes resulting from temperature changes. All copper and PVC-U pipes shall incorporate expansion joints. The provisions described in Section 6.4 of AS/NZS 2032 shall be used for PVC-U pipes.

6.3.2 At supports, and at wall and floor penetrations not incorporating expansion joints, movement shall be accommodated using pipe sleeves or a durable and flexible lagging material.

Amend 3 Sep 2010

COMMENT:
1. Thermal expansion will cause a 10 m length of PVC-U to extend 0.8 mm for each 1°C rise of pipe temperature.
2. Provision for thermal movement by correctly locating expansion joints, with fixed and sliding supports, prevents damage to pipes and *fixtures*.

6.4 Fire separation

Amends 6 and 8

6.4.1 Fire stopping shall be fitted to pipes passing through fire separations in accordance with C/AS2 Paragraph 4.4.

7.0 Watertightness

7.1 Test methods

7.1.1 All above ground sanitary plumbing pipework shall be tested by water test or air test to verify that the system is watertight.

Amend 3 Sep 2010

7.1.2 Water test: The method described in AS/NZS 2032 may be used for ensuring watertightness of above ground sanitary plumbing pipework.

Amend 7 Nov 2018

7.1.3 Air tests may be carried out in accordance with either clause 15.3 of AS/NZS 3500.2 or paragraph 8.3 of E1/VM1.

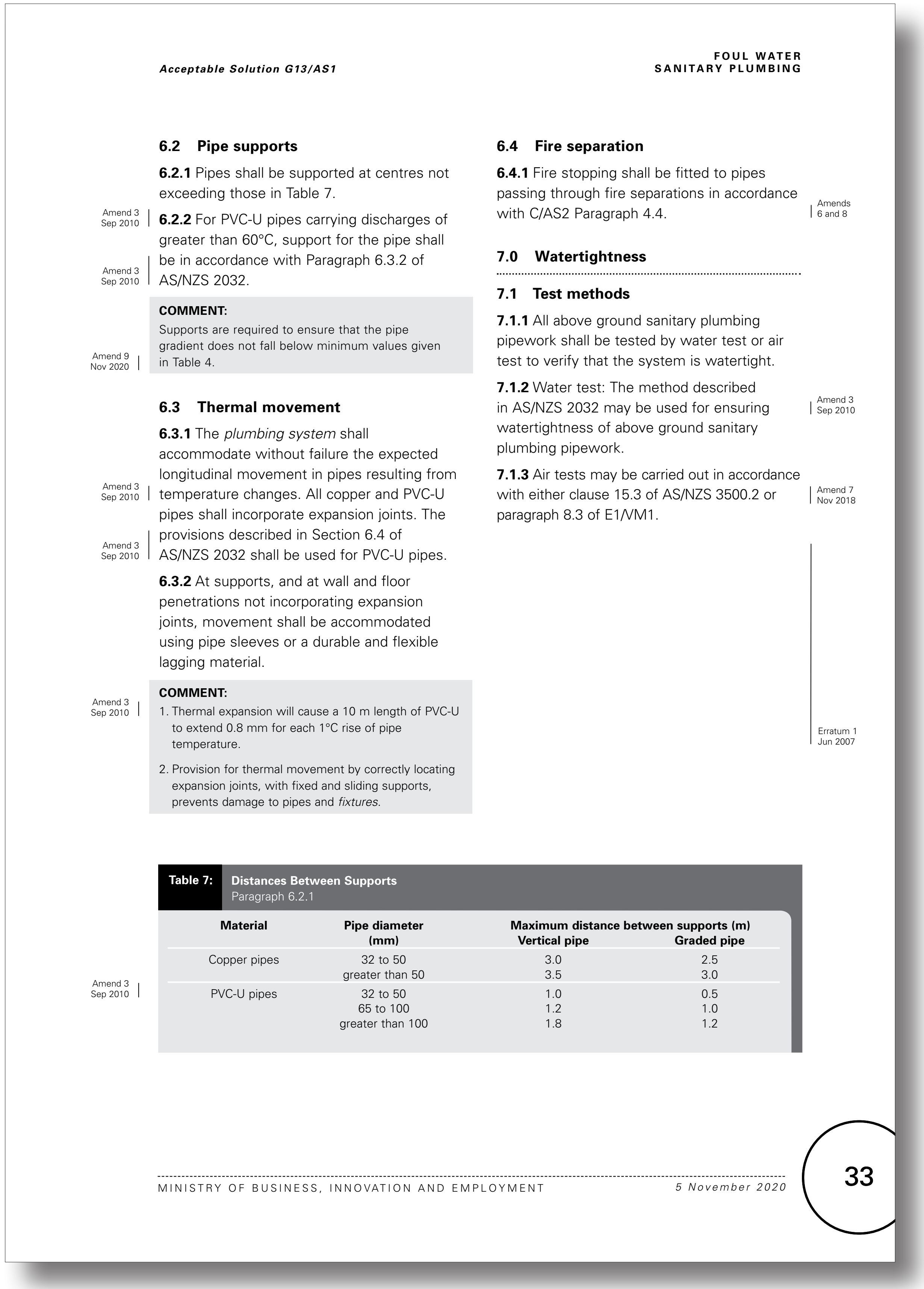
Erratum 1 Jun 2007

Table 7: Distances Between Supports
Paragraph 6.2.1

Amend 3 Sep 2010

Material	Pipe diameter (mm)	Maximum distance between supports (m) Vertical pipe	Graded pipe
Copper pipes	32 to 50 greater than 50	3.0 3.5	2.5 3.0
PVC-U pipes	32 to 50 65 to 100 greater than 100	1.0 1.2 1.8	0.5 1.0 1.2

Proposed G13 Foul Water - No changes proposed to this page



Acceptable Solution G13/AS1

FOUL WATER
SANITARY PLUMBING

6.2 Pipe supports

6.2.1 Pipes shall be supported at centres not exceeding those in Table 7.

Amend 3 Sep 2010
Amend 3 Sep 2010

6.2.2 For PVC-U pipes carrying discharges of greater than 60°C, support for the pipe shall be in accordance with Paragraph 6.3.2 of AS/NZS 2032.

Amend 9 Nov 2020

COMMENT:
Supports are required to ensure that the pipe gradient does not fall below minimum values given in Table 4.

6.3 Thermal movement

Amend 3 Sep 2010
Amend 3 Sep 2010

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6.3.2 At supports, and at wall and floor penetrations not incorporating expansion joints, movement shall be accommodated using pipe sleeves or a durable and flexible lagging material.

Amend 3 Sep 2010

COMMENT:
1. Thermal expansion will cause a 10 m length of PVC-U to extend 0.8 mm for each 1°C rise of pipe temperature.
2. Provision for thermal movement by correctly locating expansion joints, with fixed and sliding supports, prevents damage to pipes and fixtures.

6.4 Fire separation

Amends 6 and 8

6.4.1 Fire stopping shall be fitted to pipes passing through fire separations in accordance with C/AS2 Paragraph 4.4.

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Amend 3 Sep 2010

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Amend 7 Nov 2018

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Erratum 1 Jun 2007

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Paragraph 6.2.1

Amend 3 Sep 2010

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Copper pipes | 32 to 50, greater than 50 | 3.0, 3.5 | 2.5, 3.0
PVC-U pipes | 32 to 50, 65 to 100, greater than 100 | 1.0, 1.2, 1.8 | 0.5, 1.0, 1.2

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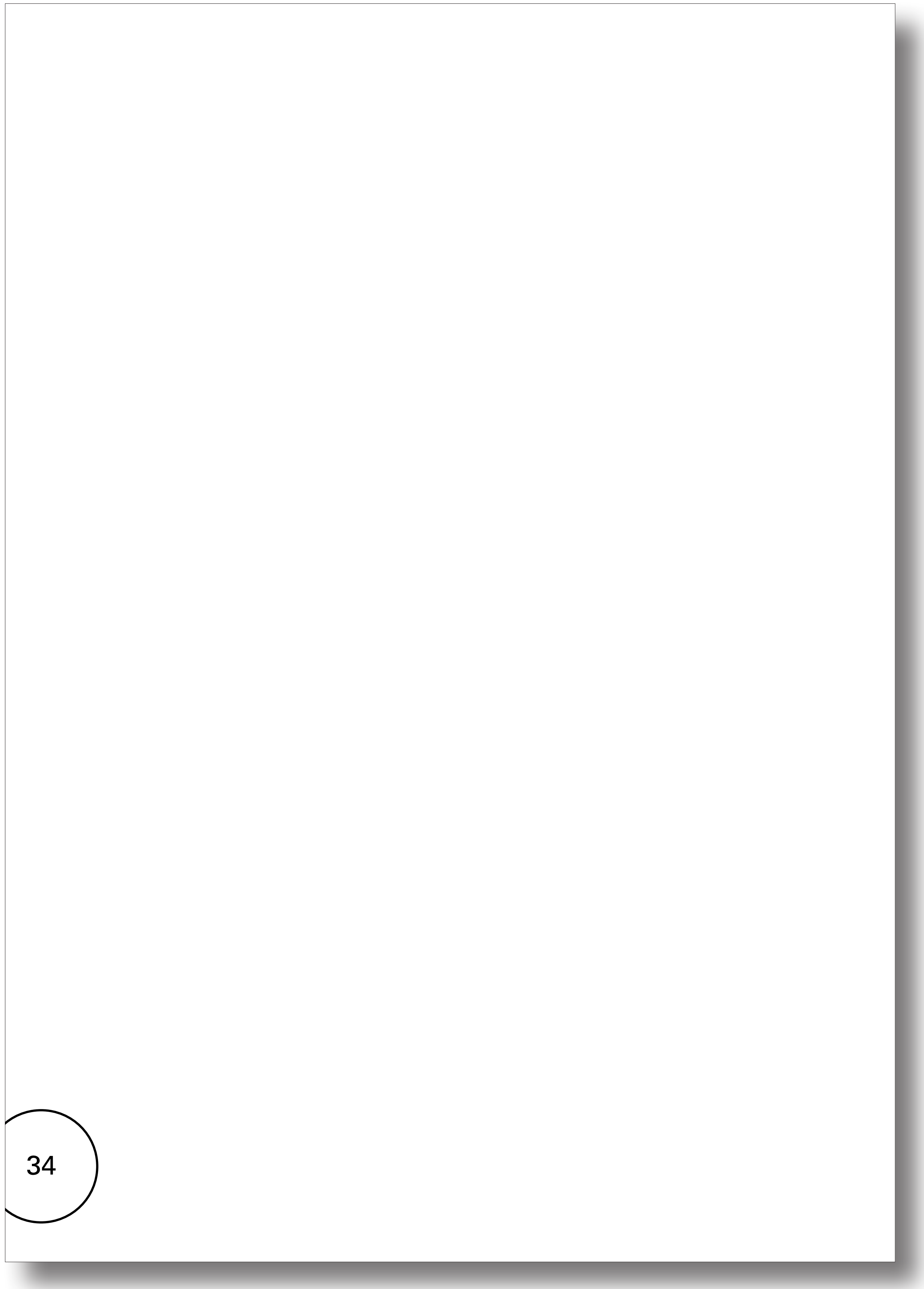
Current G13 Foul Water - No changes proposed to this page



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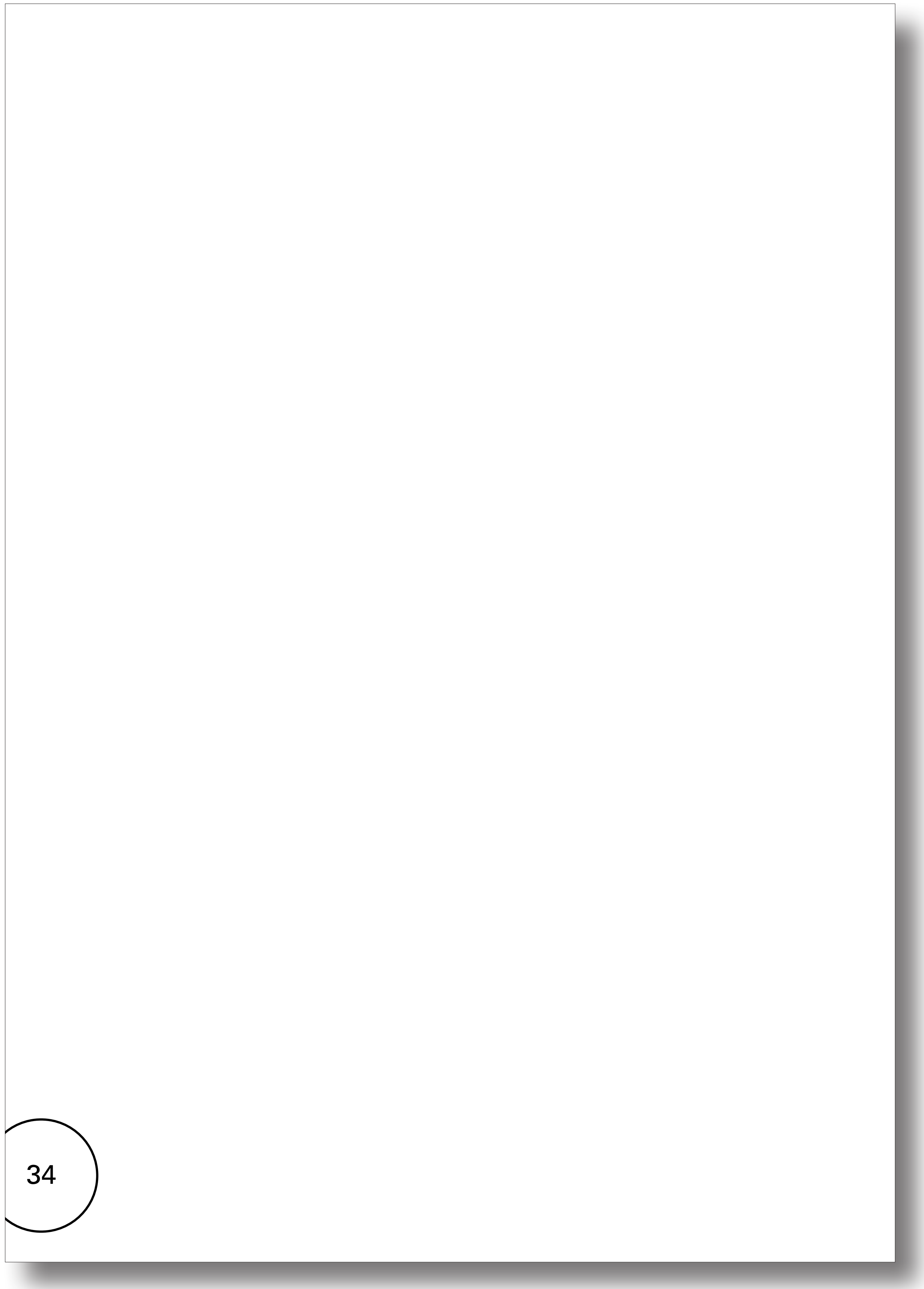
Proposed G13 Foul Water - No changes proposed to this page



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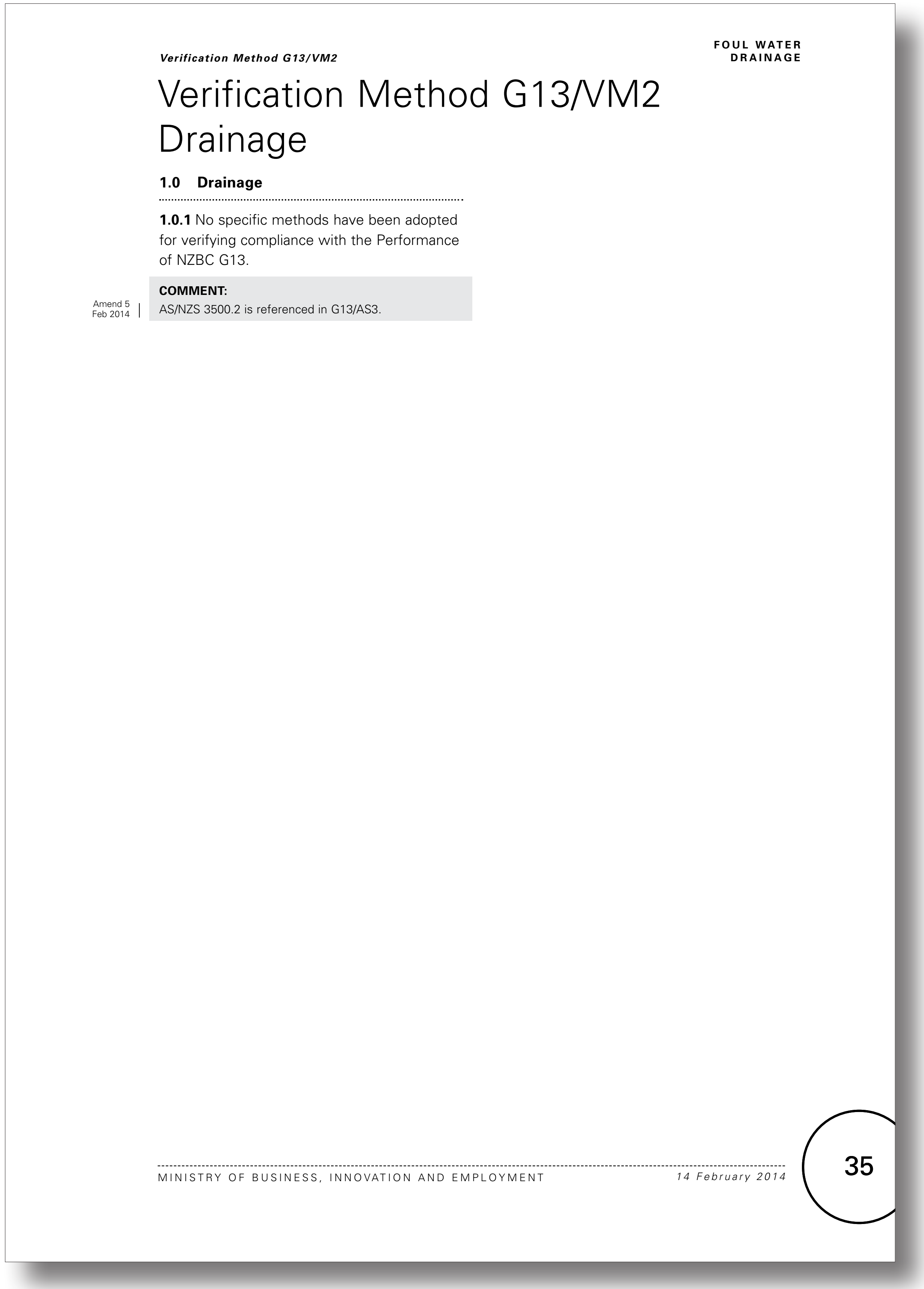


Verification Method G13/VM2

FOUL WATER DRAINAGE

Verification Method G13/VM2 Drainage

1.0 Drainage

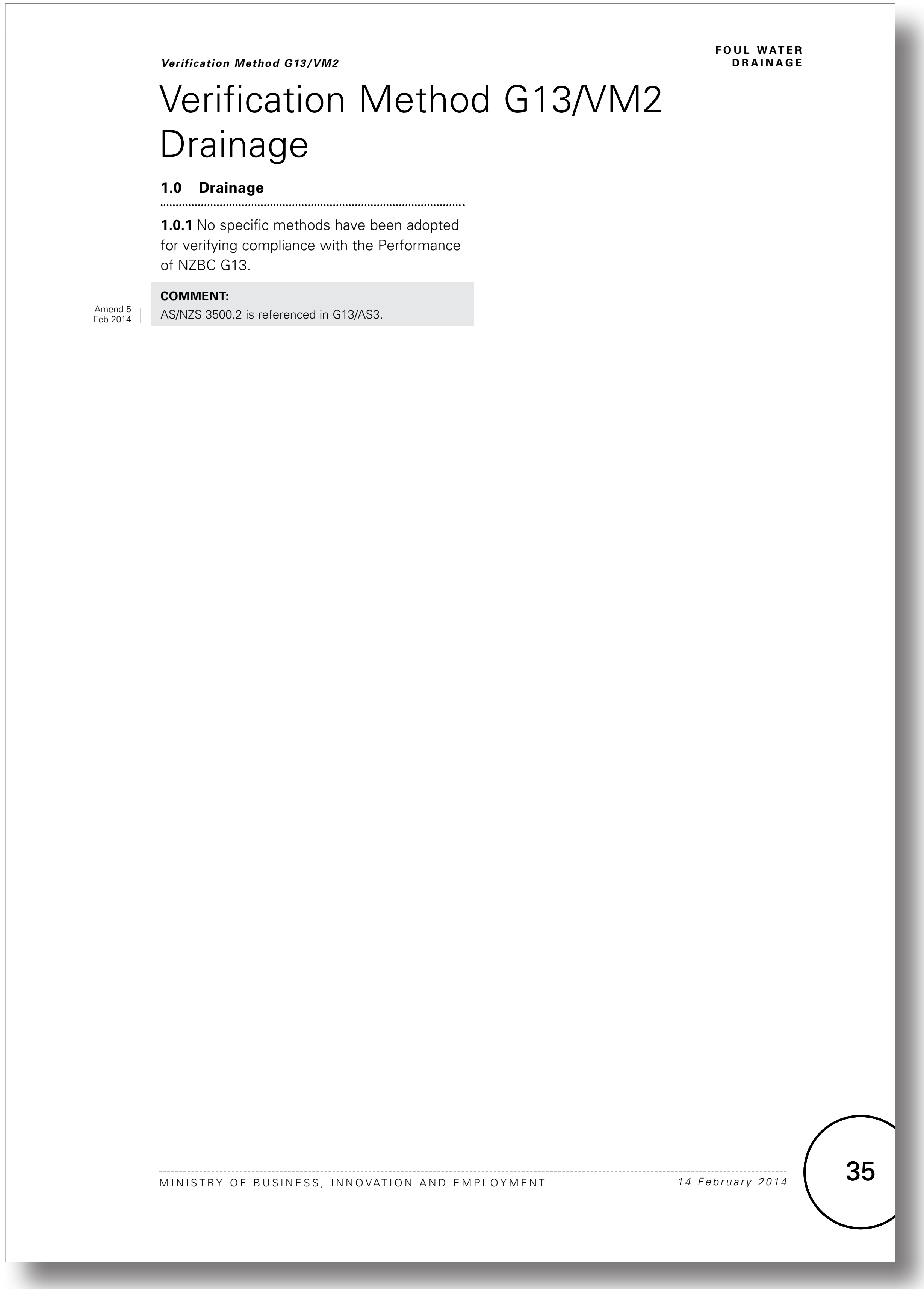
1.0.1 No specific methods have been adopted for verifying compliance with the Performance of NZBC G13.

Amend 5 Feb 2014

COMMENT:
AS/NZS 3500.2 is referenced in G13/AS3.

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT *14 February 2014* 35

Proposed G13 Foul Water - No changes proposed to this page



Verification Method G13/VM2

FOUL WATER DRAINAGE

Verification Method G13/VM2 Drainage

1.0 Drainage

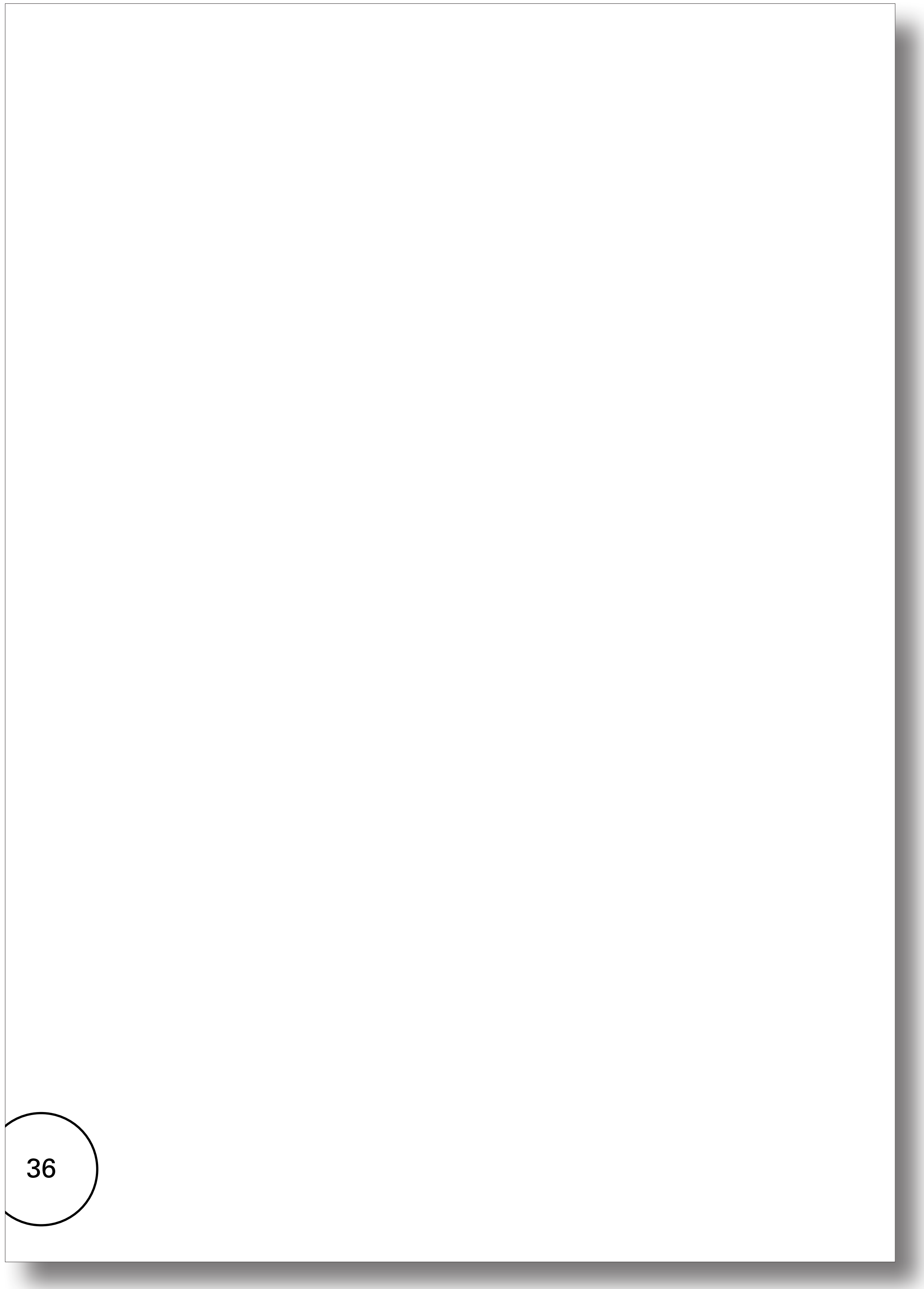
1.0.1 No specific methods have been adopted for verifying compliance with the Performance of NZBC G13.

Amend 5 Feb 2014

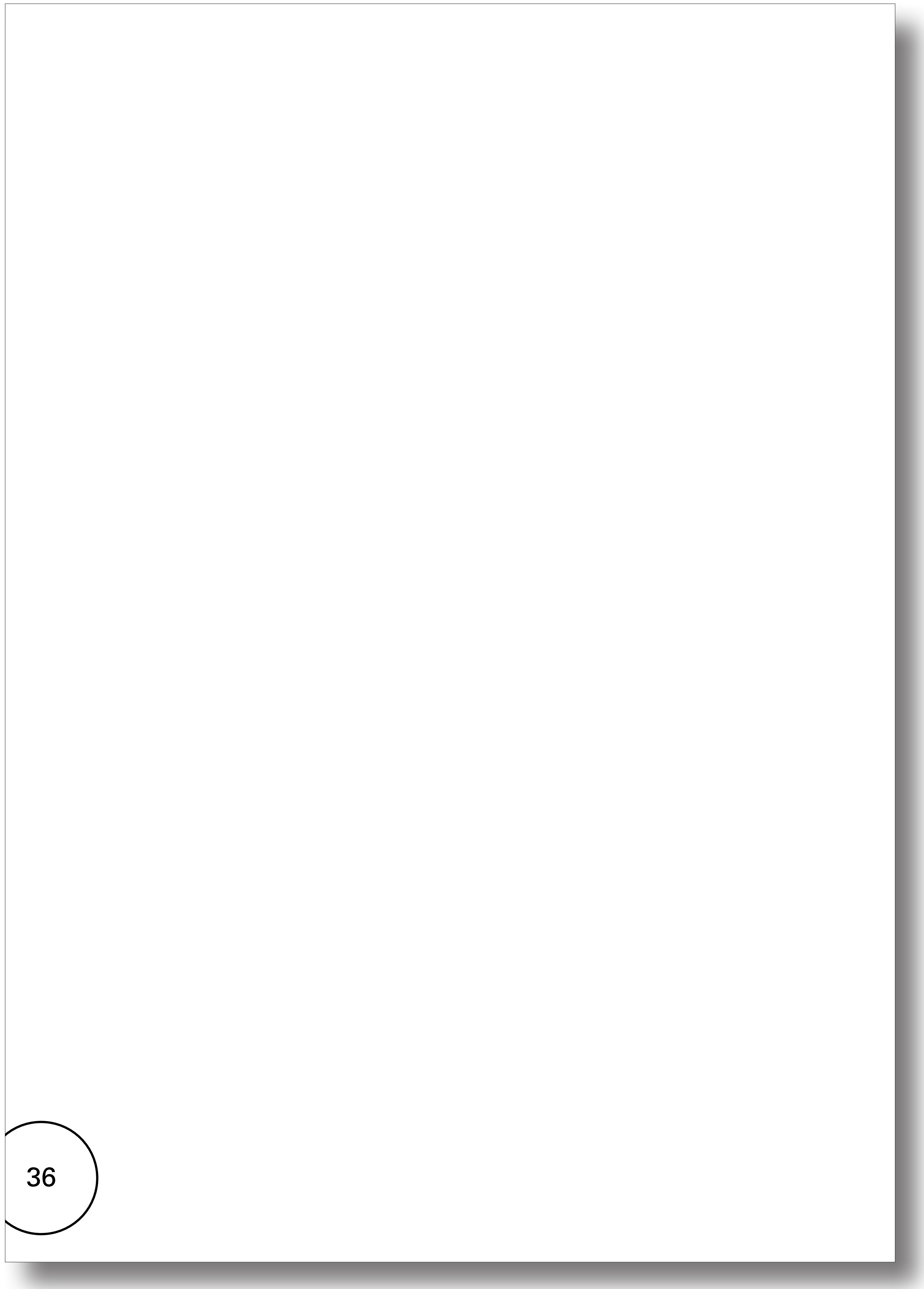
COMMENT:
AS/NZS 3500.2 is referenced in G13/AS3.

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT 14 February 2014 35

Current G13 Foul Water - No changes proposed to this page

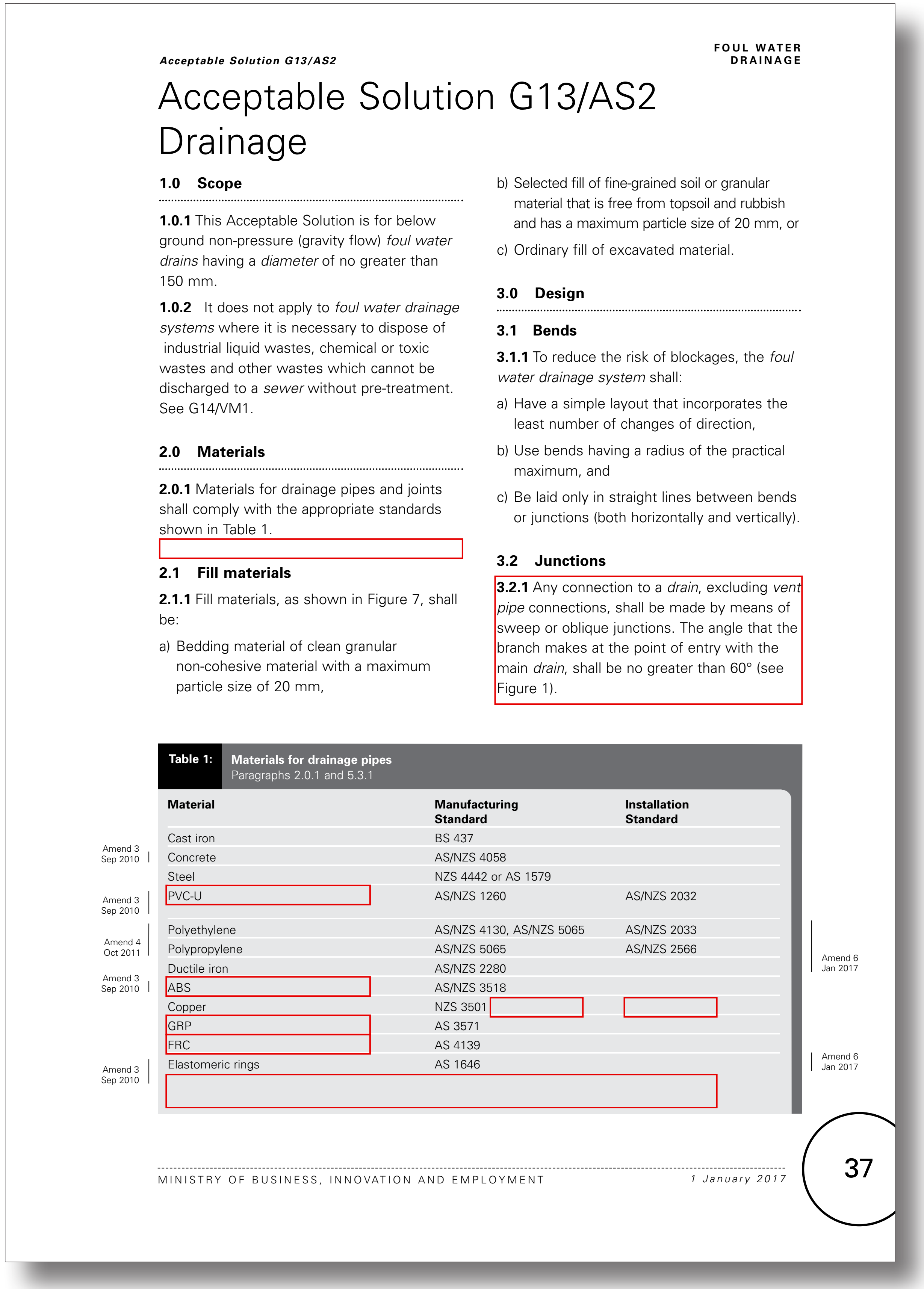


Proposed G13 Foul Water - No changes proposed to this page



Current G13 Foul Water acceptable solutions and verification methods

(Text to be amended shown in red)



Acceptable Solution G13/AS2 Drainage

1.0 Scope

1.0.1 This Acceptable Solution is for below ground non-pressure (gravity flow) *foul water drains* having a *diameter* of no greater than 150 mm.

1.0.2 It does not apply to *foul water drainage systems* where it is necessary to dispose of industrial liquid wastes, chemical or toxic wastes and other wastes which cannot be discharged to a *sewer* without pre-treatment. See G14/VM1.

2.0 Materials

2.0.1 Materials for drainage pipes and joints shall comply with the appropriate standards shown in Table 1.

2.1 Fill materials

2.1.1 Fill materials, as shown in Figure 7, shall be:

a) Bedding material of clean granular non-cohesive material with a maximum particle size of 20 mm,

b) Selected fill of fine-grained soil or granular material that is free from topsoil and rubbish and has a maximum particle size of 20 mm, or

c) Ordinary fill of excavated material.

3.0 Design

3.1 Bends

3.1.1 To reduce the risk of blockages, the *foul water drainage system* shall:

a) Have a simple layout that incorporates the least number of changes of direction,

b) Use bends having a radius of the practical maximum, and

c) Be laid only in straight lines between bends or junctions (both horizontally and vertically).

3.2 Junctions

3.2.1 Any connection to a *drain*, excluding *vent pipe* connections, shall be made by means of sweep or oblique junctions. The angle that the branch makes at the point of entry with the main *drain*, shall be no greater than 60° (see Figure 1).

Table 1: **Materials for drainage pipes**
Paragraphs 2.0.1 and 5.3.1

Material	Manufacturing Standard	Installation Standard
Cast iron	BS 437	
Concrete	AS/NZS 4058	
Steel	NZS 4442 or AS 1579	
PVC-U	AS/NZS 1260	AS/NZS 2032
Polyethylene	AS/NZS 4130, AS/NZS 5065	AS/NZS 2033
Polypropylene	AS/NZS 5065	AS/NZS 2566
Ductile iron	AS/NZS 2280	
ABS	AS/NZS 3518	
Copper	NZS 3501	
GRP	AS 3571	
FRC	AS 4139	
Elastomeric rings	AS 1646	

Amend 3 Sep 2010

Amend 3 Sep 2010

Amend 4 Oct 2011

Amend 3 Sep 2010

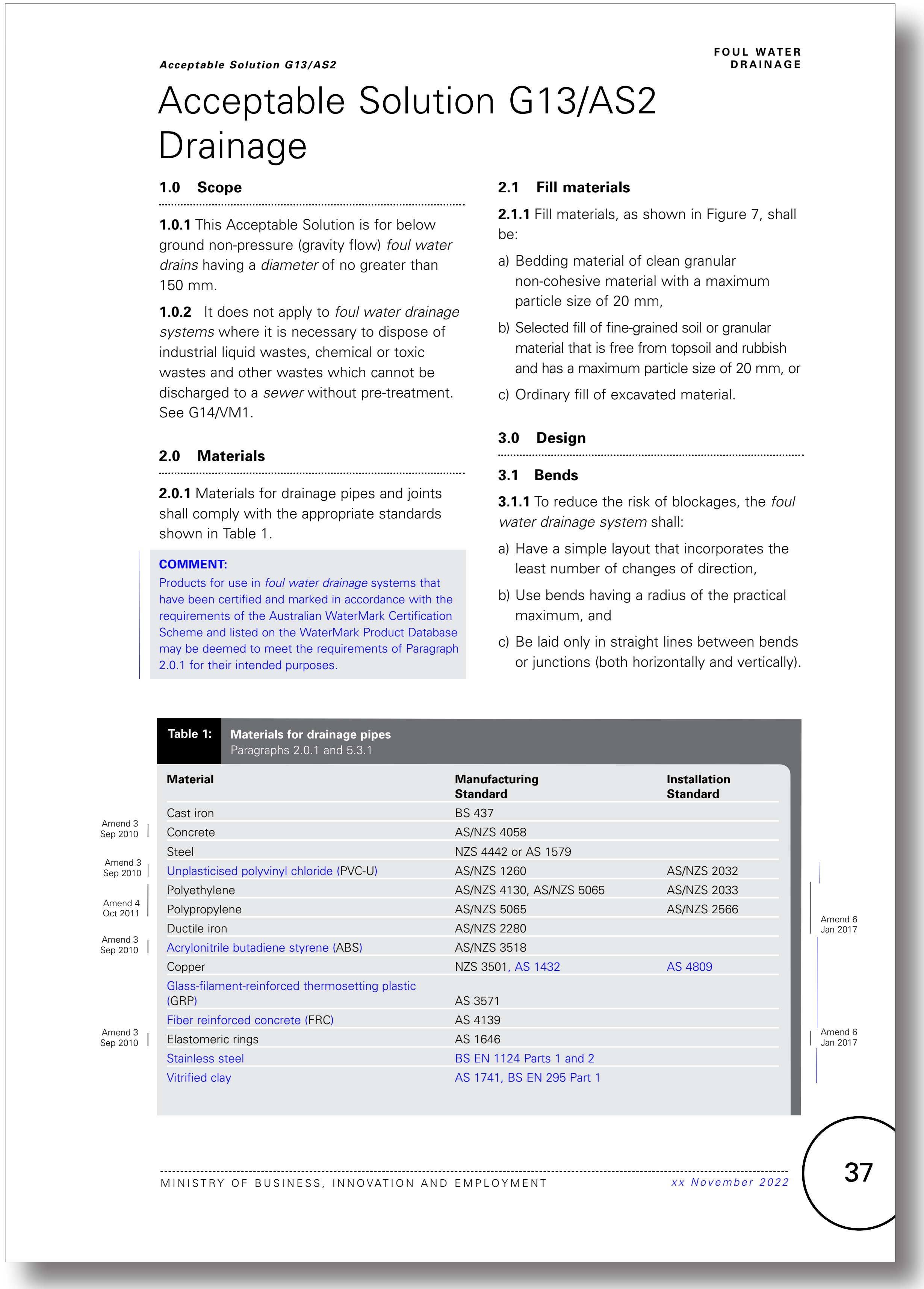
Amend 3 Sep 2010

Amend 6 Jan 2017

Amend 6 Jan 2017

Proposed amendments to G13 Foul Water acceptable solutions and verification methods

(Proposed text in blue)



Acceptable Solution G13/AS2 Drainage

1.0 Scope

1.0.1 This Acceptable Solution is for below ground non-pressure (gravity flow) *foul water drains* having a *diameter* of no greater than 150 mm.

1.0.2 It does not apply to *foul water drainage systems* where it is necessary to dispose of industrial liquid wastes, chemical or toxic wastes and other wastes which cannot be discharged to a *sewer* without pre-treatment. See G14/VM1.

2.0 Materials

2.0.1 Materials for drainage pipes and joints shall comply with the appropriate standards shown in Table 1.

COMMENT:
Products for use in *foul water drainage* systems that have been certified and marked in accordance with the requirements of the Australian WaterMark Certification Scheme and listed on the WaterMark Product Database may be deemed to meet the requirements of Paragraph 2.0.1 for their intended purposes.

2.1 Fill materials

2.1.1 Fill materials, as shown in Figure 7, shall be:

a) Bedding material of clean granular non-cohesive material with a maximum particle size of 20 mm,

b) Selected fill of fine-grained soil or granular material that is free from topsoil and rubbish and has a maximum particle size of 20 mm, or

c) Ordinary fill of excavated material.

3.0 Design

3.1 Bends

3.1.1 To reduce the risk of blockages, the *foul water drainage system* shall:

a) Have a simple layout that incorporates the least number of changes of direction,

b) Use bends having a radius of the practical maximum, and

c) Be laid only in straight lines between bends or junctions (both horizontally and vertically).

Table 1: **Materials for drainage pipes**
Paragraphs 2.0.1 and 5.3.1

Material	Manufacturing Standard	Installation Standard
Cast iron	BS 437	
Concrete	AS/NZS 4058	
Steel	NZS 4442 or AS 1579	
Unplasticised polyvinyl chloride (PVC-U)	AS/NZS 1260	AS/NZS 2032
Polyethylene	AS/NZS 4130, AS/NZS 5065	AS/NZS 2033
Polypropylene	AS/NZS 5065	AS/NZS 2566
Ductile iron	AS/NZS 2280	
Acrylonitrile butadiene styrene (ABS)	AS/NZS 3518	
Copper	NZS 3501, AS 1432	AS 4809
Glass-filament-reinforced thermosetting plastic (GRP)	AS 3571	
Fiber reinforced concrete (FRC)	AS 4139	
Elastomeric rings	AS 1646	
Stainless steel	BS EN 1124 Parts 1 and 2	
Vitrified clay	AS 1741, BS EN 295 Part 1	

Amend 3 Sep 2010

Amend 3 Sep 2010

Amend 4 Oct 2011

Amend 3 Sep 2010

Amend 3 Sep 2010

Amend 6 Jan 2017

Amend 6 Jan 2017

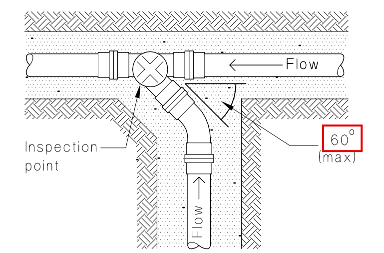
Current G13 Foul Water acceptable solutions and verification methods

(Text to be amended shown in red)

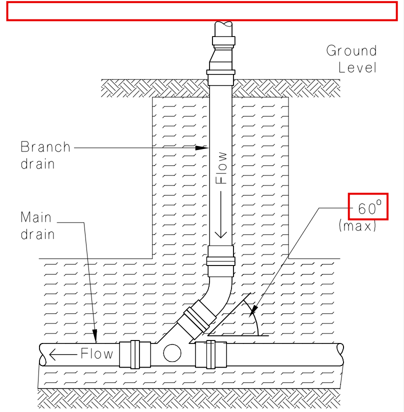
FOUL WATER
DRAINAGE

Acceptable Solution G13/AS2

Figure 1: **Connection of drains**
Paragraph 3.2.1

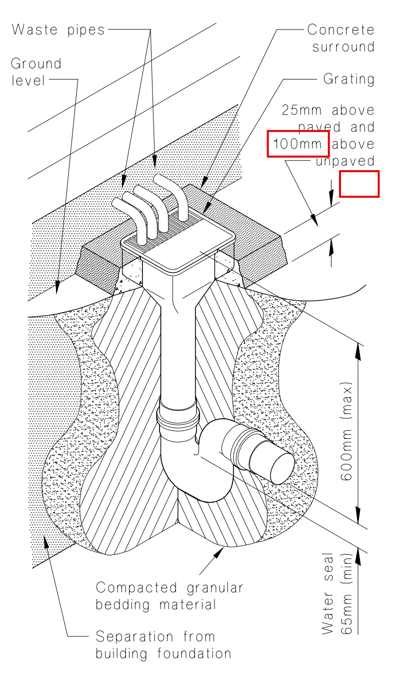


(a) Horizontal connection



(b) Vertical connection

Figure 2: **Details of gully traps**
Paragraph 3.3.1



3.3 Gully traps

3.3.1 All *gully traps* shall be constructed to prevent the ingress of *surface water* and foreign bodies likely to cause a blockage, shall be located within the legal boundary of the land on which the *building* is erected, and shall have (see Figures 2 and 3):

a) The overflow level of the gully dish no less than:

- i) 25 mm above paved surfaces, or
- ii) 100 mm above unpaved surfaces,

COMMENT:
It is imperative that the *waste pipe* connections to the *gully trap* remain watertight to prevent the ingress of ground/*surface water*.

b) A grating that will allow surcharge,

c) A minimum outlet pipe *diameter* of 100 mm,

d) A *water seal* depth of at least 65 mm,

e) At least one *discharge pipe* discharging to the *gully trap* to avoid *water seal* evaporation,

f) *Waste pipes* that discharge to the *gully trap* arranged to permit easy cleaning of the *gully trap*,

g) *Waste pipe* outlets located at least 20 mm above *water seal* level, and at least 20 mm below the grating,

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1 October 2001 DEPARTMENT OF BUILDING AND HOUSING

Proposed amendments to G13 Foul Water acceptable solutions and verification methods

(Proposed text in blue)

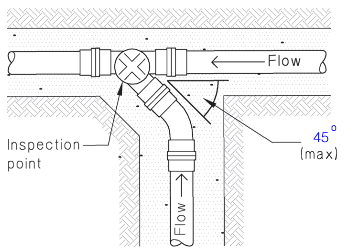
FOUL WATER
DRAINAGE

Acceptable Solution G13/AS2

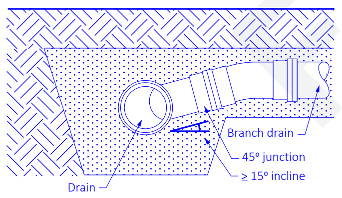
3.2 Junctions

3.2.1 Any connection to a *drain*, excluding *vent pipe* connections, shall be made by means of a junction with an upstream angle no greater than 45° and installed in the direction of flow. Junctions in graded drains shall be installed so that the entry level of the branch drain is elevated at an incline of not less than 15° above the horizontal (see Figure 1).

Figure 1: **Connection of drains**
Paragraph 3.2.1

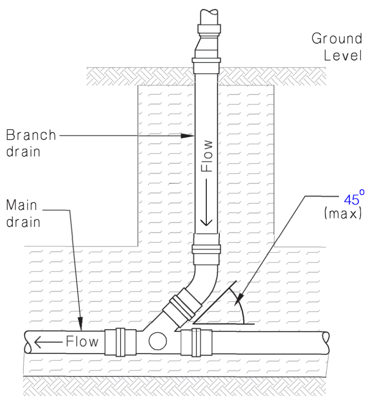


(a) Graded connection



Side elevation view

(b) Inclined junction



(c) Vertical connection

3.3 Gully traps

3.3.1 All *gully traps* shall be constructed to prevent the ingress of *surface water* and foreign bodies likely to cause a blockage, shall be located within the legal boundary of the land on which the *building* is erected, and shall have (see Figures 2 and 3):

a) The overflow level of the gully dish no less than:

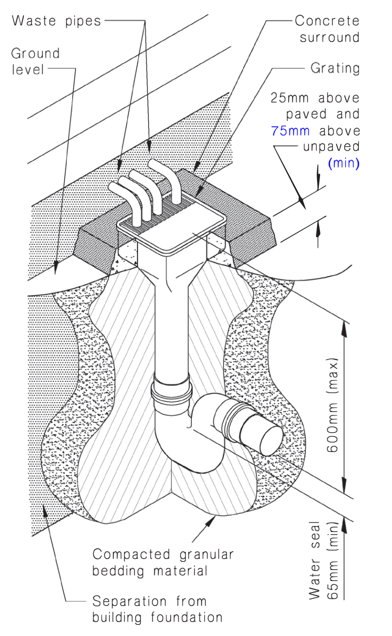
- i) 25 mm above paved surfaces, or
- ii) 75 mm above unpaved surfaces,

COMMENT:
It is imperative that the *waste pipe* connections to the *gully trap* remain watertight to prevent the ingress of ground/*surface water*.

Amend 9
Nov 2020

Continued on page 40

Figure 2: **Details of gully traps**
Paragraph 3.3.1



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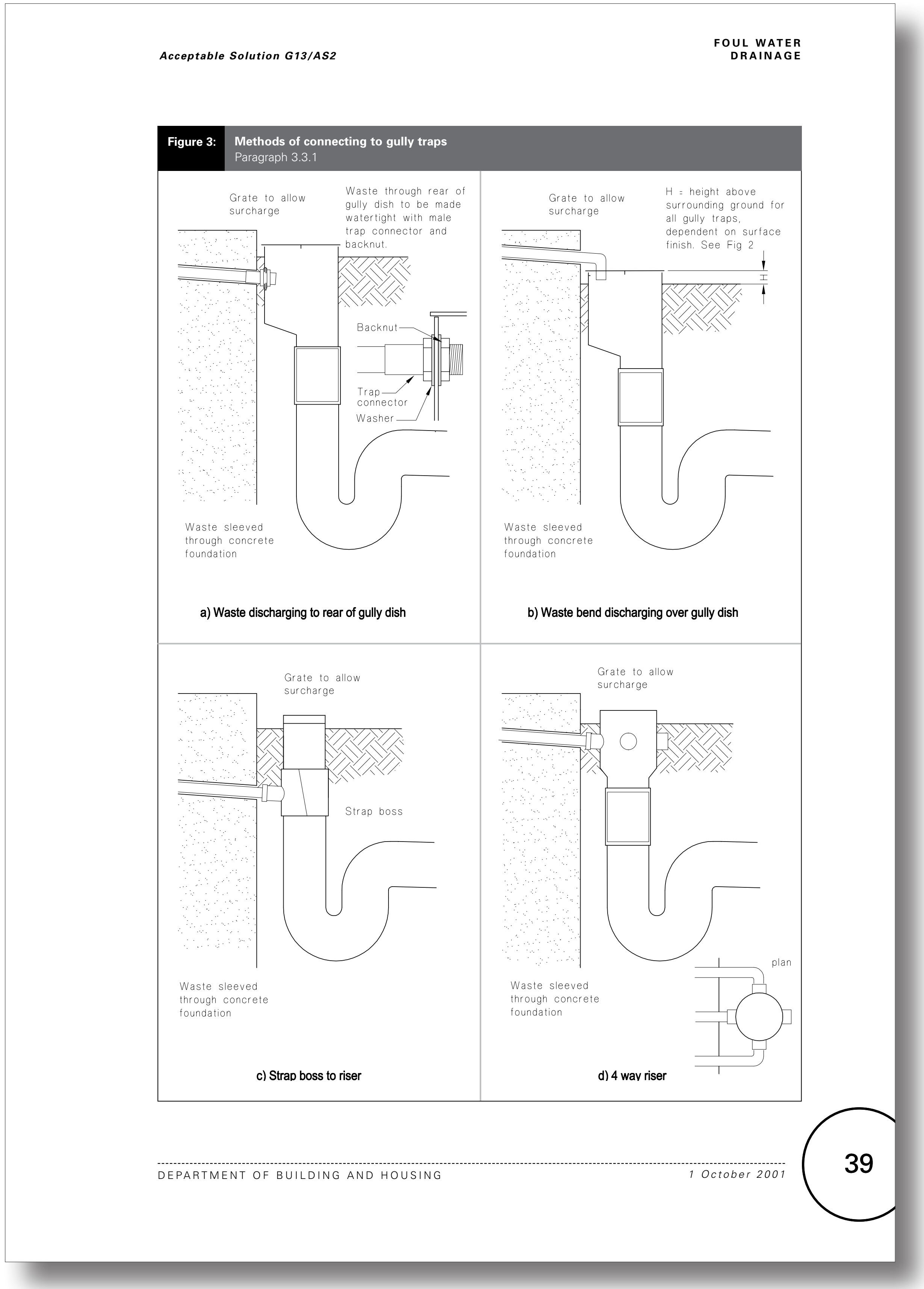
xx November 2022 MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Current G13 Foul Water - No changes proposed to this page



Acceptable Solution G13/AS2

FOUL WATER DRAINAGE

Figure 3: **Methods of connecting to gully traps**
Paragraph 3.3.1

a) Waste discharging to rear of gully dish

b) Waste bend discharging over gully dish

c) Strap boss to riser

d) 4 way riser

DEPARTMENT OF BUILDING AND HOUSING

1 October 2001

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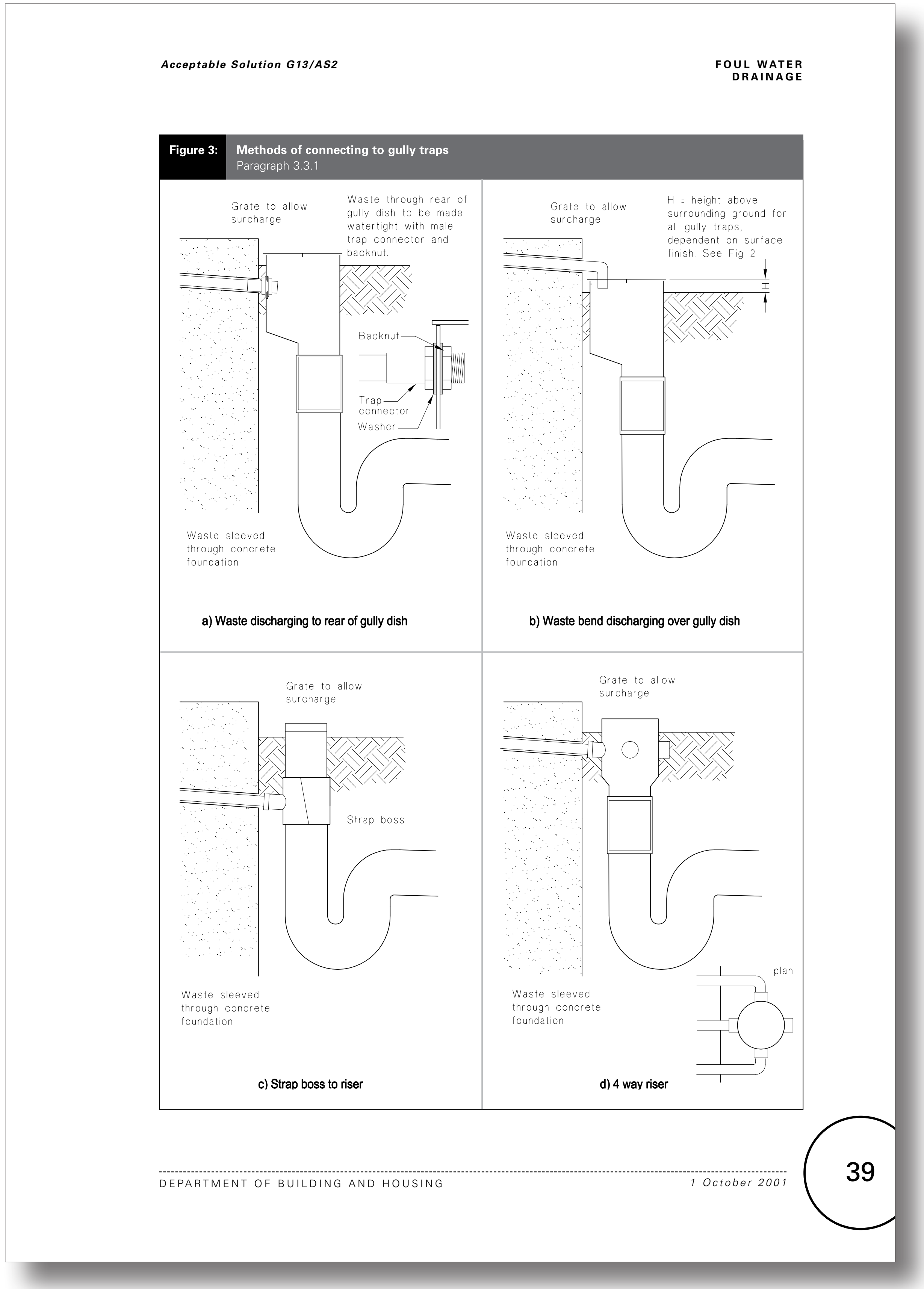
Proposed G13 Foul Water - No changes proposed to this page



Acceptable Solution G13/AS2

FOUL WATER DRAINAGE

Figure 3: **Methods of connecting to gully traps**
Paragraph 3.3.1

a) Waste discharging to rear of gully dish

b) Waste bend discharging over gully dish

c) Strap boss to riser

d) 4 way riser

DEPARTMENT OF BUILDING AND HOUSING

1 October 2001

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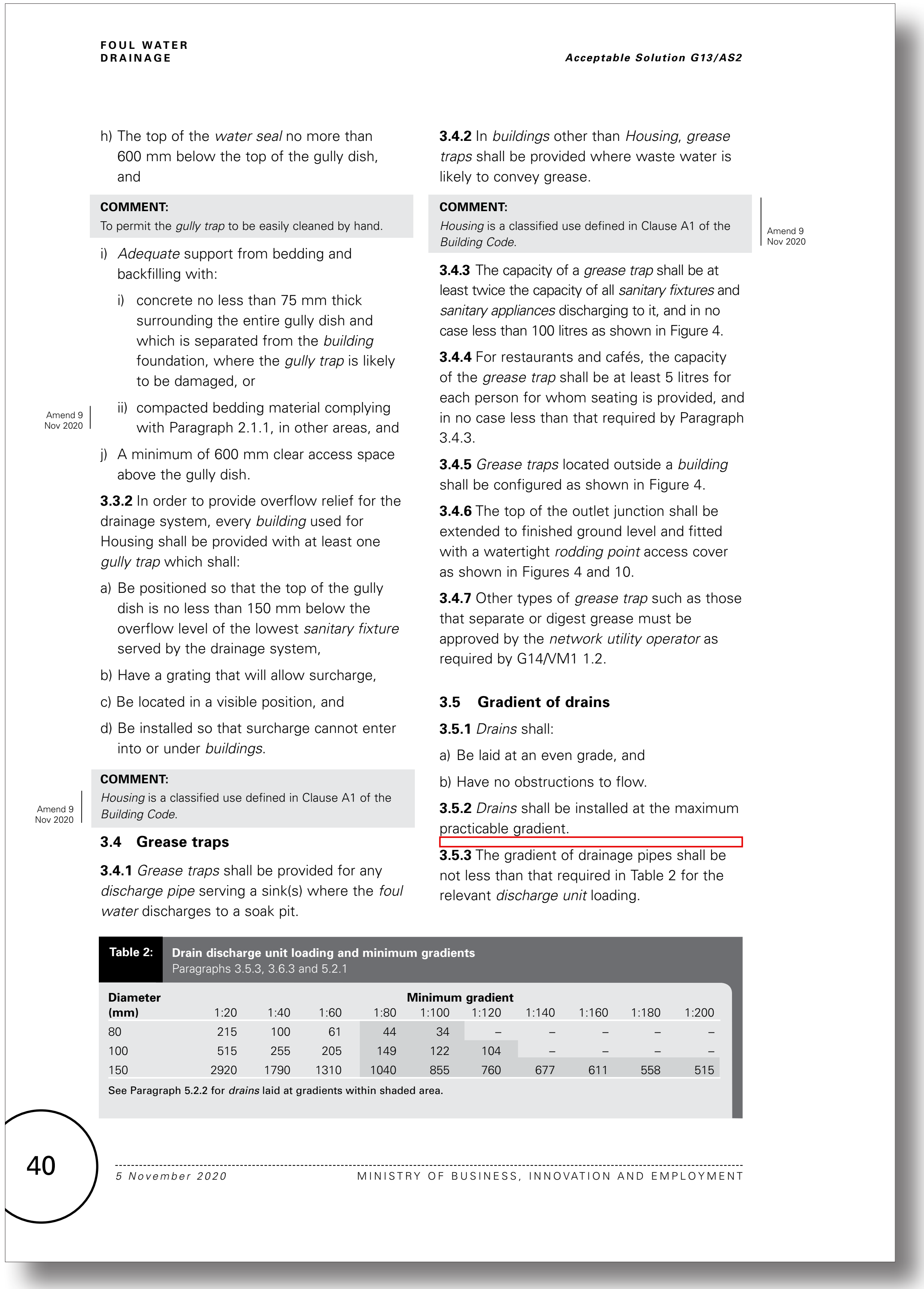
Current G13 Foul Water acceptable solutions and verification methods

(Text to be amended shown in red)



FOUL WATER DRAINAGE

Acceptable Solution G13/AS2

h) The top of the *water seal* no more than 600 mm below the top of the gully dish, and

COMMENT:
To permit the *gully trap* to be easily cleaned by hand.

i) *Adequate* support from bedding and backfilling with:

- i) concrete no less than 75 mm thick surrounding the entire gully dish and which is separated from the *building* foundation, where the *gully trap* is likely to be damaged, or
- ii) compacted bedding material complying with Paragraph 2.1.1, in other areas, and

Amend 9
Nov 2020

j) A minimum of 600 mm clear access space above the gully dish.

3.3.2 In order to provide overflow relief for the drainage system, every *building* used for Housing shall be provided with at least one *gully trap* which shall:

a) Be positioned so that the top of the gully dish is no less than 150 mm below the overflow level of the lowest *sanitary fixture* served by the drainage system,

b) Have a grating that will allow surcharge,

c) Be located in a visible position, and

d) Be installed so that surcharge cannot enter into or under *buildings*.

COMMENT:
Housing is a classified use defined in Clause A1 of the *Building Code.*

Amend 9
Nov 2020

3.4 Grease traps

3.4.1 *Grease traps* shall be provided for any *discharge pipe* serving a sink(s) where the *foul water* discharges to a soak pit.

3.4.2 In *buildings* other than *Housing*, *grease traps* shall be provided where waste water is likely to convey grease.

COMMENT:
Housing is a classified use defined in Clause A1 of the *Building Code.*

Amend 9
Nov 2020

3.4.3 The capacity of a *grease trap* shall be at least twice the capacity of all *sanitary fixtures* and *sanitary appliances* discharging to it, and in no case less than 100 litres as shown in Figure 4.

3.4.4 For restaurants and cafés, the capacity of the *grease trap* shall be at least 5 litres for each person for whom seating is provided, and in no case less than that required by Paragraph 3.4.3.

3.4.5 *Grease traps* located outside a *building* shall be configured as shown in Figure 4.

3.4.6 The top of the outlet junction shall be extended to finished ground level and fitted with a watertight *rodding point* access cover as shown in Figures 4 and 10.

3.4.7 Other types of *grease trap* such as those that separate or digest grease must be approved by the *network utility operator* as required by G14/VM1 1.2.

3.5 Gradient of drains

3.5.1 *Drains* shall:

a) Be laid at an even grade, and

b) Have no obstructions to flow.

3.5.2 *Drains* shall be installed at the maximum practicable gradient.

3.5.3 The gradient of drainage pipes shall be not less than that required in Table 2 for the relevant *discharge unit* loading.

Table 2: Drain discharge unit loading and minimum gradients
Paragraphs 3.5.3, 3.6.3 and 5.2.1

Diameter (mm)	Minimum gradient 1:20	1:40	1:60	1:80	1:100	1:120	1:140	1:160	1:180	1:200
80	215	100	61	44	34	–	–	–	–	–
100	515	255	205	149	122	104	–	–	–	–
150	2920	1790	1310	1040	855	760	677	611	558	515

See Paragraph 5.2.2 for *drains* laid at gradients within shaded area.

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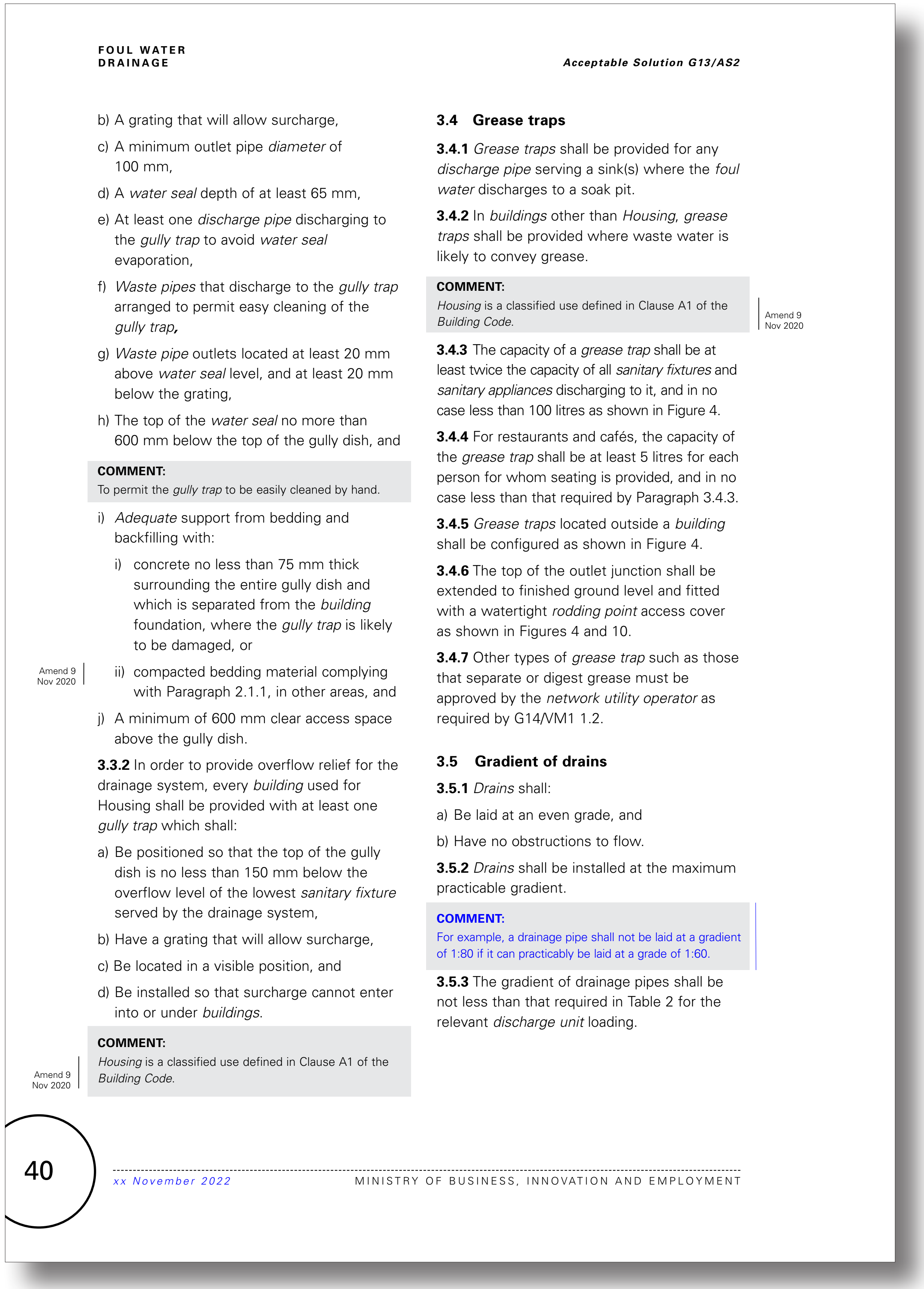
5 November 2020 MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Proposed amendments to G13 Foul Water acceptable solutions and verification methods (Proposed text in blue)



FOUL WATER DRAINAGE

Acceptable Solution G13/AS2

b) A grating that will allow surcharge,

c) A minimum outlet pipe *diameter* of 100 mm,

d) A *water seal* depth of at least 65 mm,

e) At least one *discharge pipe* discharging to the *gully trap* to avoid *water seal* evaporation,

f) *Waste pipes* that discharge to the *gully trap* arranged to permit easy cleaning of the *gully trap*,

g) *Waste pipe* outlets located at least 20 mm above *water seal* level, and at least 20 mm below the grating,

h) The top of the *water seal* no more than 600 mm below the top of the gully dish, and

COMMENT:
To permit the *gully trap* to be easily cleaned by hand.

i) *Adequate* support from bedding and backfilling with:

- i) concrete no less than 75 mm thick surrounding the entire gully dish and which is separated from the *building* foundation, where the *gully trap* is likely to be damaged, or
- ii) compacted bedding material complying with Paragraph 2.1.1, in other areas, and

Amend 9
Nov 2020

j) A minimum of 600 mm clear access space above the gully dish.

3.3.2 In order to provide overflow relief for the drainage system, every *building* used for Housing shall be provided with at least one *gully trap* which shall:

a) Be positioned so that the top of the gully dish is no less than 150 mm below the overflow level of the lowest *sanitary fixture* served by the drainage system,

b) Have a grating that will allow surcharge,

c) Be located in a visible position, and

d) Be installed so that surcharge cannot enter into or under *buildings*.

COMMENT:
Housing is a classified use defined in Clause A1 of the *Building Code.*

Amend 9
Nov 2020

3.4 Grease traps

3.4.1 *Grease traps* shall be provided for any *discharge pipe* serving a sink(s) where the *foul water* discharges to a soak pit.

3.4.2 In *buildings* other than *Housing*, *grease traps* shall be provided where waste water is likely to convey grease.

COMMENT:
Housing is a classified use defined in Clause A1 of the *Building Code.*

Amend 9
Nov 2020

3.4.3 The capacity of a *grease trap* shall be at least twice the capacity of all *sanitary fixtures* and *sanitary appliances* discharging to it, and in no case less than 100 litres as shown in Figure 4.

3.4.4 For restaurants and cafés, the capacity of the *grease trap* shall be at least 5 litres for each person for whom seating is provided, and in no case less than that required by Paragraph 3.4.3.

3.4.5 *Grease traps* located outside a *building* shall be configured as shown in Figure 4.

3.4.6 The top of the outlet junction shall be extended to finished ground level and fitted with a watertight *rodding point* access cover as shown in Figures 4 and 10.

3.4.7 Other types of *grease trap* such as those that separate or digest grease must be approved by the *network utility operator* as required by G14/VM1 1.2.

3.5 Gradient of drains

3.5.1 *Drains* shall:

a) Be laid at an even grade, and

b) Have no obstructions to flow.

3.5.2 *Drains* shall be installed at the maximum practicable gradient.

COMMENT:
For example, a drainage pipe shall not be laid at a gradient of 1:80 if it can practicably be laid at a grade of 1:60.

3.5.3 The gradient of drainage pipes shall be not less than that required in Table 2 for the relevant *discharge unit* loading.

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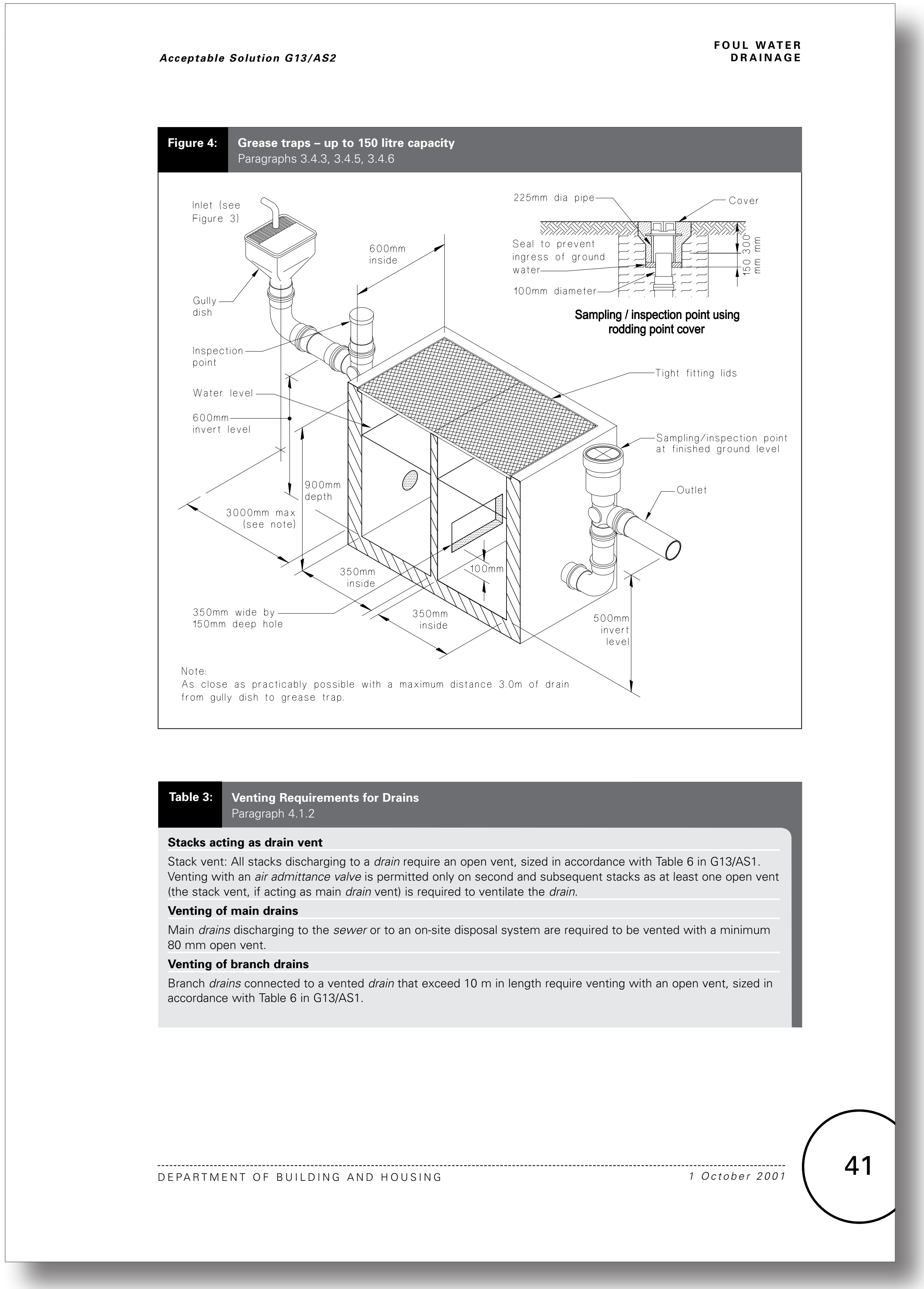

Figure 4: **Grease traps – up to 150 litre capacity**
Paragraphs 3.4.3, 3.4.5, 3.4.6

Note:
As close as practicably possible with a maximum distance 3.0m of drain from gully dish to grease trap.

Table 3: **Venting Requirements for Drains**
Paragraph 4.1.2

Stacks acting as drain vent

Stack vent: All stacks discharging to a *drain* require an open vent, sized in accordance with Table 6 in G13/AS1. Venting with an *air admittance valve* is permitted only on second and subsequent stacks as at least one open vent (the stack vent, if acting as main *drain* vent) is required to ventilate the *drain*.

Venting of main drains

Main *drains* discharging to the *sewer* or to an on-site disposal system are required to be vented with a minimum 80 mm open vent.

Venting of branch drains

Branch *drains* connected to a vented *drain* that exceed 10 m in length require venting with an open vent, sized in accordance with Table 6 in G13/AS1.

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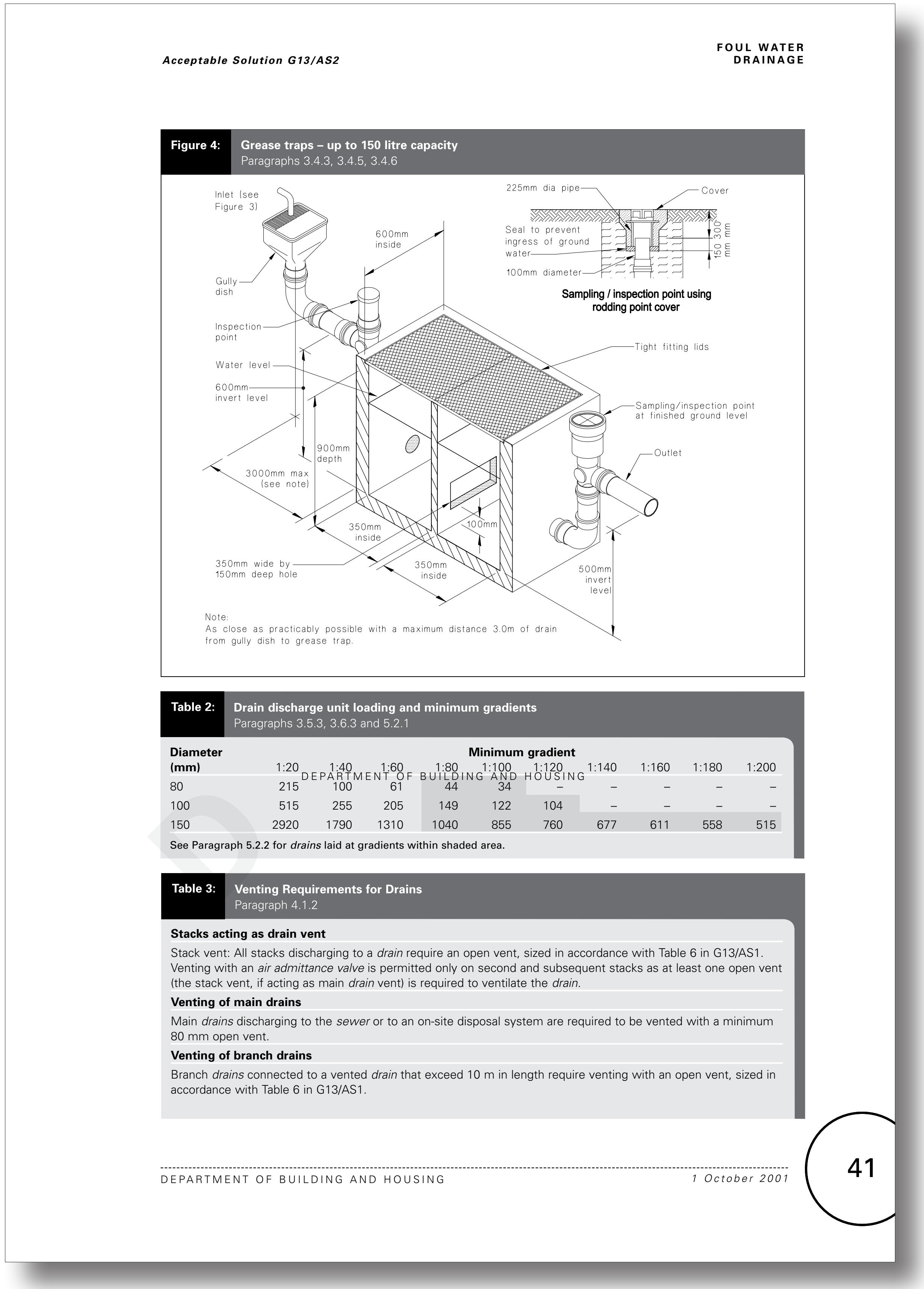

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Paragraphs 3.4.3, 3.4.5, 3.4.6

Note:
As close as practicably possible with a maximum distance 3.0m of drain from gully dish to grease trap.

Table 2: **Drain discharge unit loading and minimum gradients**
Paragraphs 3.5.3, 3.6.3 and 5.2.1

Diameter (mm)	**Minimum gradient** 1:20	1:40	1:60	1:80	1:100	1:120	1:140	1:160	1:180	1:200
80	215	100	61	44	34	–	–	–	–	–
100	515	255	205	149	122	104	–	–	–	–
150	2920	1790	1310	1040	855	760	677	611	558	515

See Paragraph 5.2.2 for *drains* laid at gradients within shaded area.

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Paragraph 4.1.2

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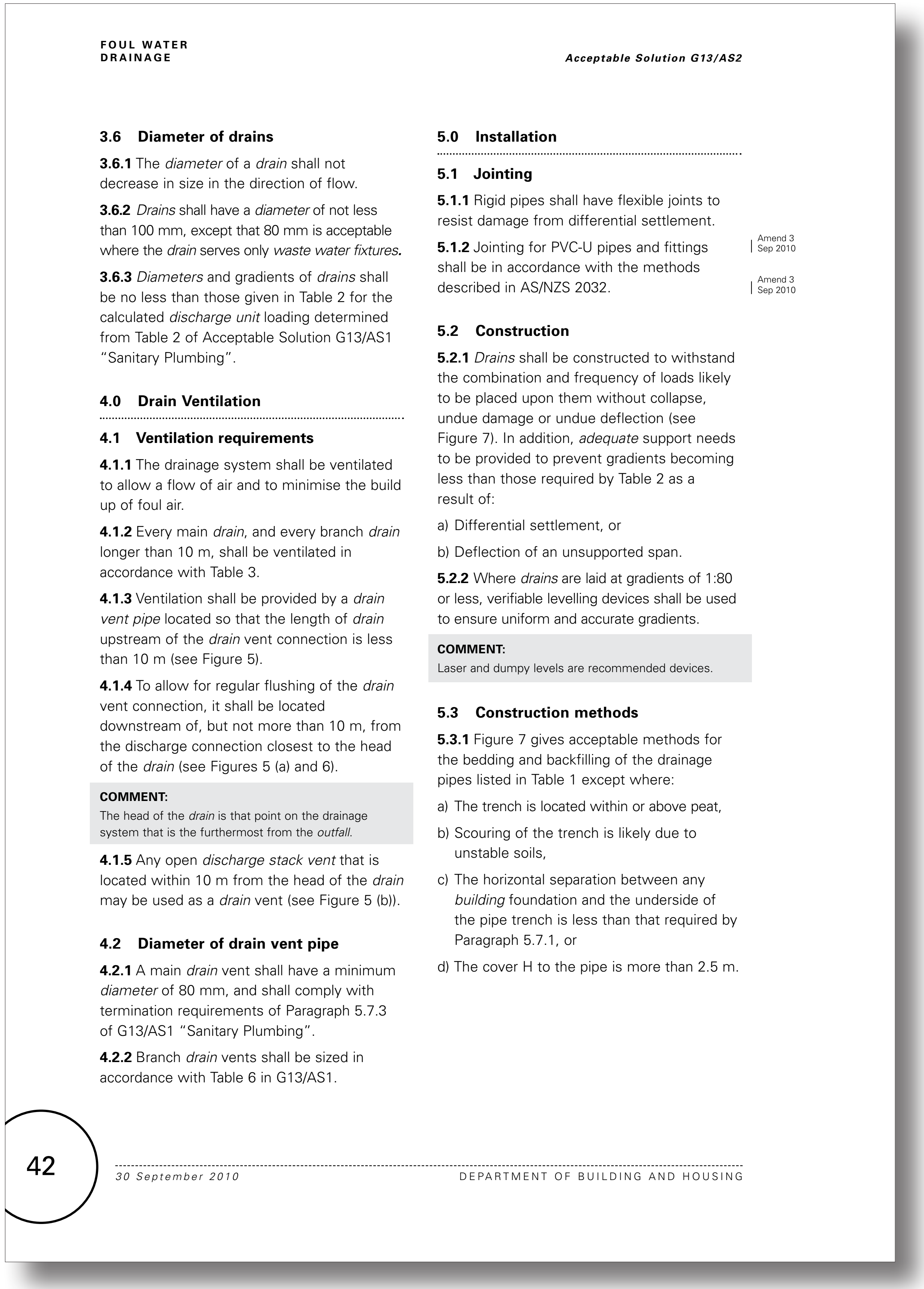

3.6 Diameter of drains

3.6.1 The *diameter* of a *drain* shall not decrease in size in the direction of flow.

3.6.2 *Drains* shall have a *diameter* of not less than 100 mm, except that 80 mm is acceptable where the *drain* serves only *waste water fixtures*.

3.6.3 *Diameters* and gradients of *drains* shall be no less than those given in Table 2 for the calculated *discharge unit* loading determined from Table 2 of Acceptable Solution G13/AS1 "Sanitary Plumbing".

4.0 Drain Ventilation

4.1 Ventilation requirements

4.1.1 The drainage system shall be ventilated to allow a flow of air and to minimise the build up of foul air.

4.1.2 Every main *drain*, and every branch *drain* longer than 10 m, shall be ventilated in accordance with Table 3.

4.1.3 Ventilation shall be provided by a *drain vent pipe* located so that the length of *drain* upstream of the *drain* vent connection is less than 10 m (see Figure 5).

4.1.4 To allow for regular flushing of the *drain* vent connection, it shall be located downstream of, but not more than 10 m, from the discharge connection closest to the head of the *drain* (see Figures 5 (a) and 6).

COMMENT:
The head of the *drain* is that point on the drainage system that is the furthermost from the *outfall*.

4.1.5 Any open *discharge stack vent* that is located within 10 m from the head of the *drain* may be used as a *drain* vent (see Figure 5 (b)).

4.2 Diameter of drain vent pipe

4.2.1 A main *drain* vent shall have a minimum *diameter* of 80 mm, and shall comply with termination requirements of Paragraph 5.7.3 of G13/AS1 "Sanitary Plumbing".

4.2.2 Branch *drain* vents shall be sized in accordance with Table 6 in G13/AS1.

5.0 Installation

5.1 Jointing

5.1.1 Rigid pipes shall have flexible joints to resist damage from differential settlement.

Amend 3
Sep 2010

5.1.2 Jointing for PVC-U pipes and fittings shall be in accordance with the methods described in AS/NZS 2032.

Amend 3
Sep 2010

5.2 Construction

5.2.1 *Drains* shall be constructed to withstand the combination and frequency of loads likely to be placed upon them without collapse, undue damage or undue deflection (see Figure 7). In addition, *adequate* support needs to be provided to prevent gradients becoming less than those required by Table 2 as a result of:

a) Differential settlement, or

b) Deflection of an unsupported span.

5.2.2 Where *drains* are laid at gradients of 1:80 or less, verifiable levelling devices shall be used to ensure uniform and accurate gradients.

COMMENT:
Laser and dumpy levels are recommended devices.

5.3 Construction methods

5.3.1 Figure 7 gives acceptable methods for the bedding and backfilling of the drainage pipes listed in Table 1 except where:

a) The trench is located within or above peat,

b) Scouring of the trench is likely due to unstable soils,

c) The horizontal separation between any *building* foundation and the underside of the pipe trench is less than that required by Paragraph 5.7.1, or

d) The cover H to the pipe is more than 2.5 m.

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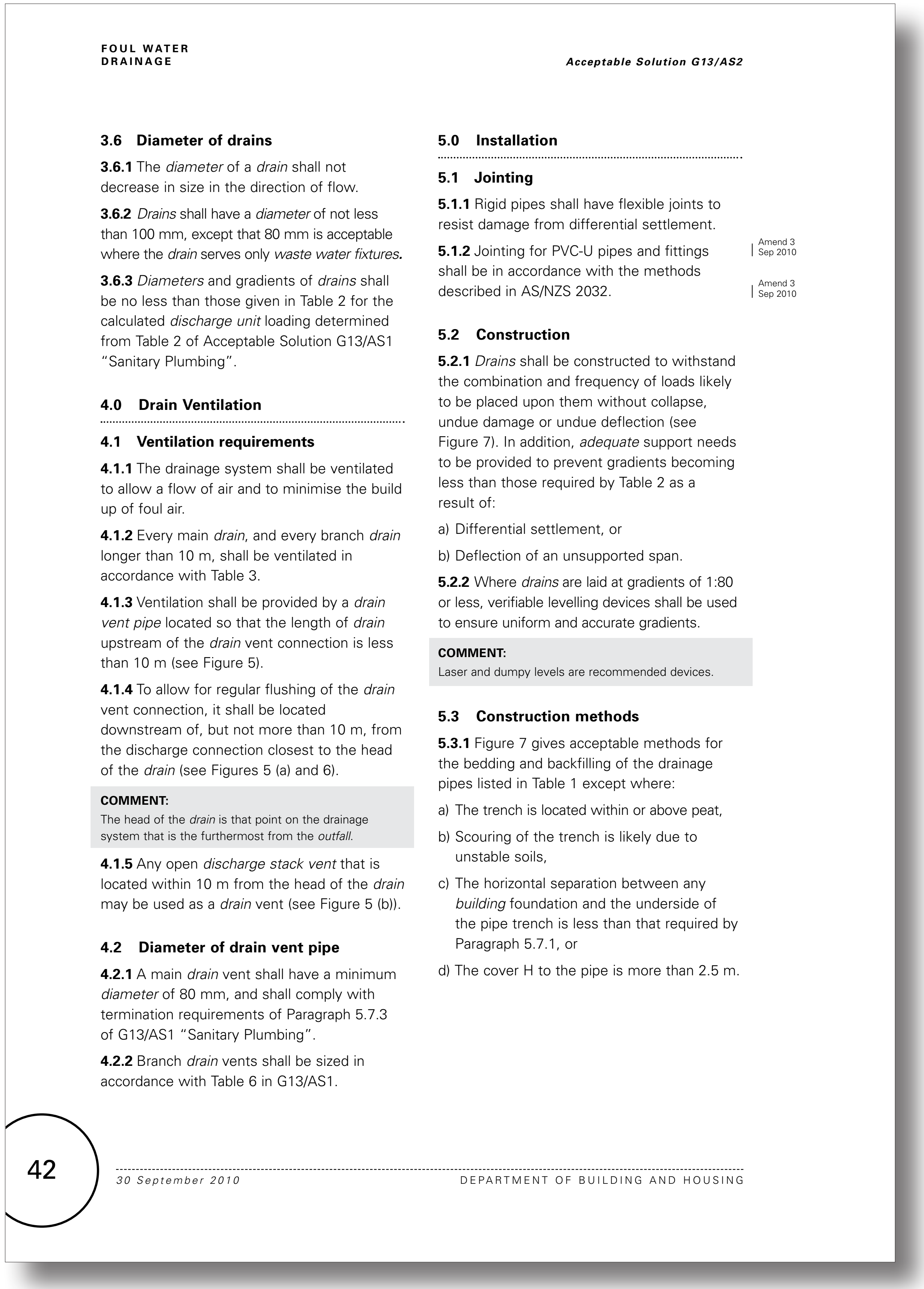
FOUL WATER
DRAINAGE
Acceptable Solution G13/AS2

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Amend 3
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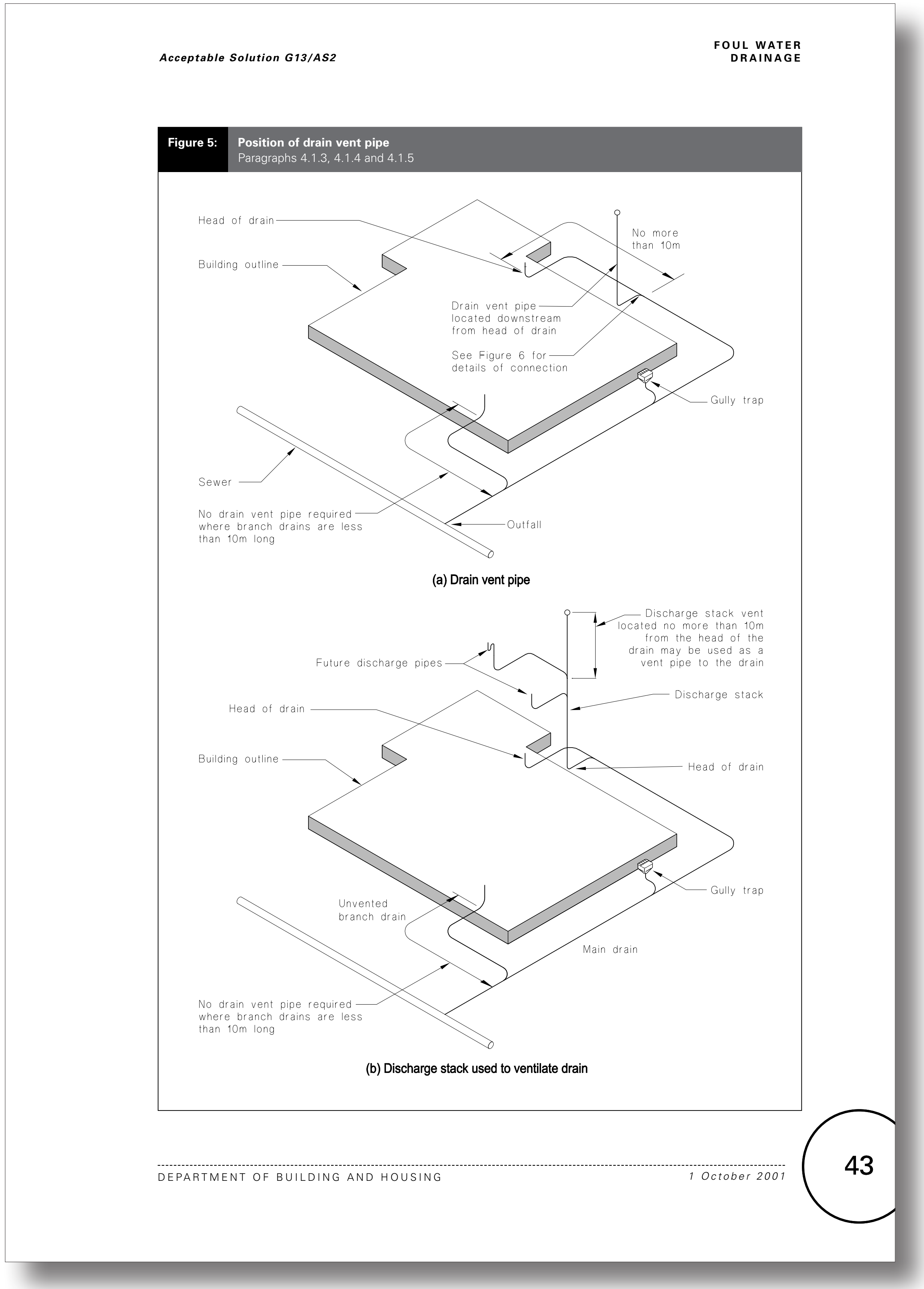

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FOUL WATER DRAINAGE

Figure 5: **Position of drain vent pipe**
Paragraphs 4.1.3, 4.1.4 and 4.1.5

(a) Drain vent pipe

(b) Discharge stack used to ventilate drain

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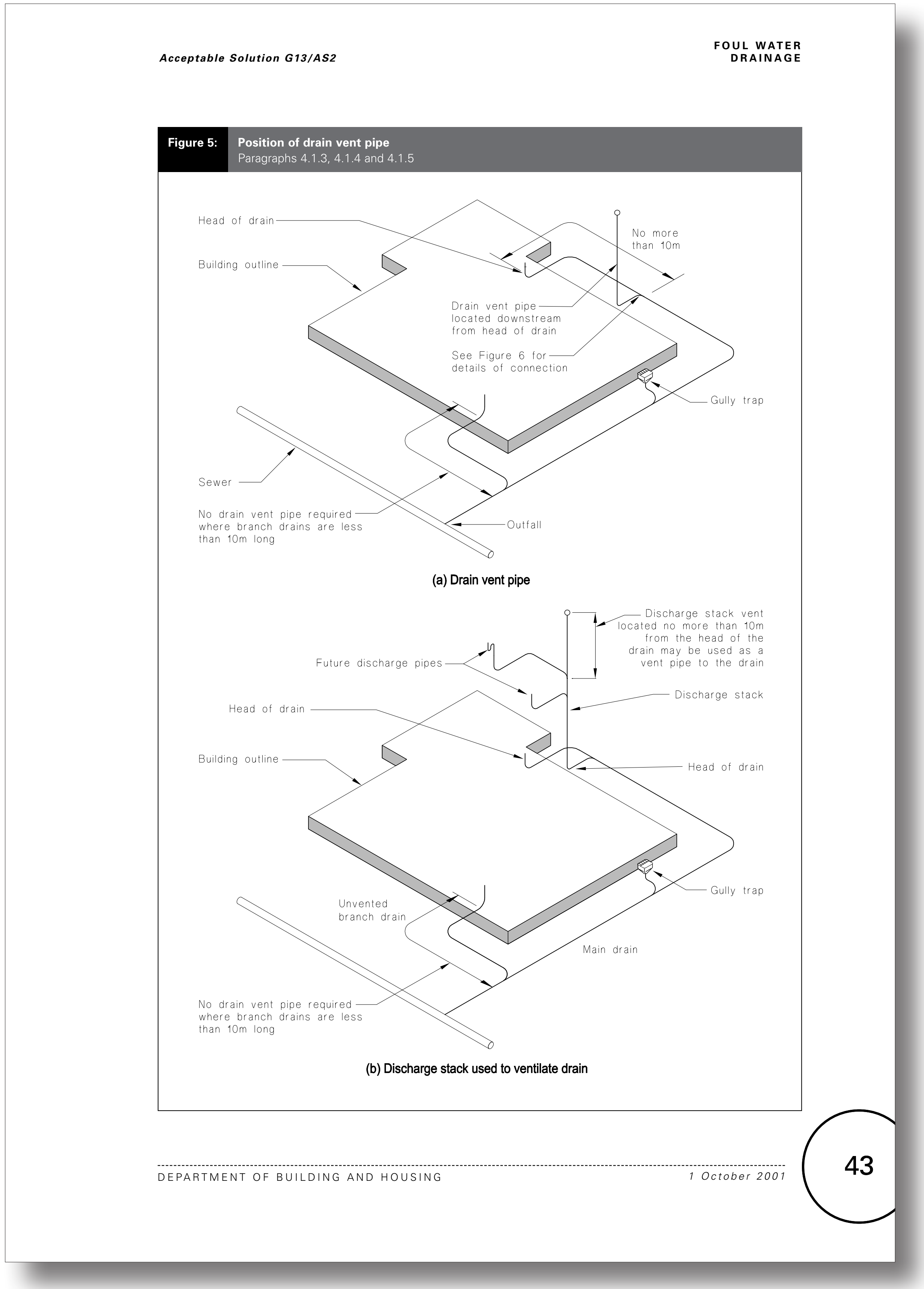

Acceptable Solution G13/AS2

FOUL WATER DRAINAGE

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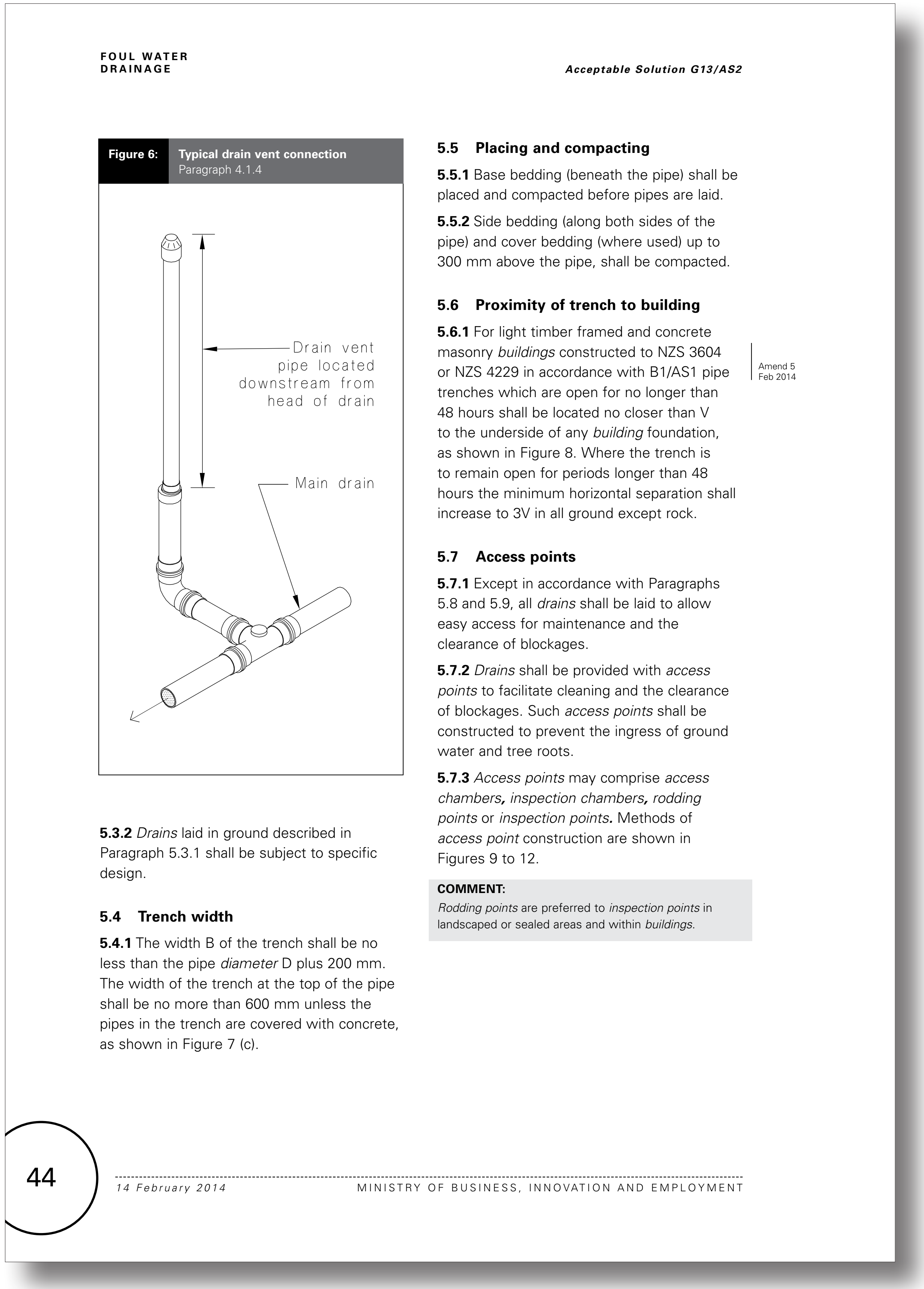

Figure 6: **Typical drain vent connection**
Paragraph 4.1.4

5.3.2 *Drains* laid in ground described in Paragraph 5.3.1 shall be subject to specific design.

5.4 Trench width

5.4.1 The width B of the trench shall be no less than the pipe *diameter* D plus 200 mm. The width of the trench at the top of the pipe shall be no more than 600 mm unless the pipes in the trench are covered with concrete, as shown in Figure 7 (c).

5.5 Placing and compacting

5.5.1 Base bedding (beneath the pipe) shall be placed and compacted before pipes are laid.

5.5.2 Side bedding (along both sides of the pipe) and cover bedding (where used) up to 300 mm above the pipe, shall be compacted.

5.6 Proximity of trench to building

5.6.1 For light timber framed and concrete masonry *buildings* constructed to NZS 3604 or NZS 4229 in accordance with B1/AS1 pipe trenches which are open for no longer than 48 hours shall be located no closer than V to the underside of any *building* foundation, as shown in Figure 8. Where the trench is to remain open for periods longer than 48 hours the minimum horizontal separation shall increase to 3V in all ground except rock.

Amend 5
Feb 2014

5.7 Access points

5.7.1 Except in accordance with Paragraphs 5.8 and 5.9, all *drains* shall be laid to allow easy access for maintenance and the clearance of blockages.

5.7.2 *Drains* shall be provided with *access points* to facilitate cleaning and the clearance of blockages. Such *access points* shall be constructed to prevent the ingress of ground water and tree roots.

5.7.3 *Access points* may comprise *access chambers, inspection chambers, rodding points* or *inspection points.* Methods of *access point* construction are shown in Figures 9 to 12.

COMMENT:
Rodding points are preferred to *inspection points* in landscaped or sealed areas and within *buildings.*

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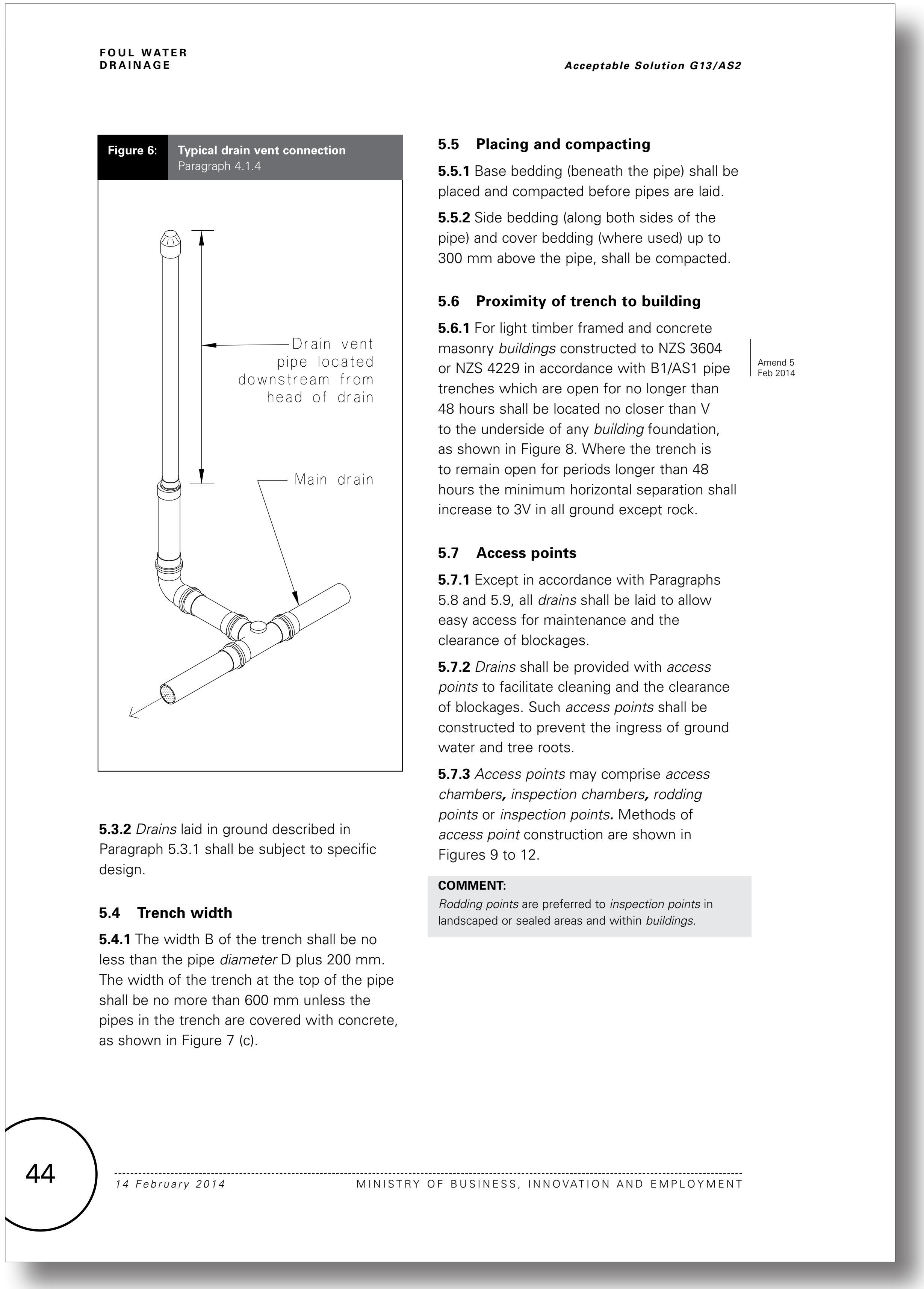

FOUL WATER DRAINAGE

Acceptable Solution G13/AS2

Figure 6: **Typical drain vent connection**
Paragraph 4.1.4

Drain vent pipe located downstream from head of drain
Main drain

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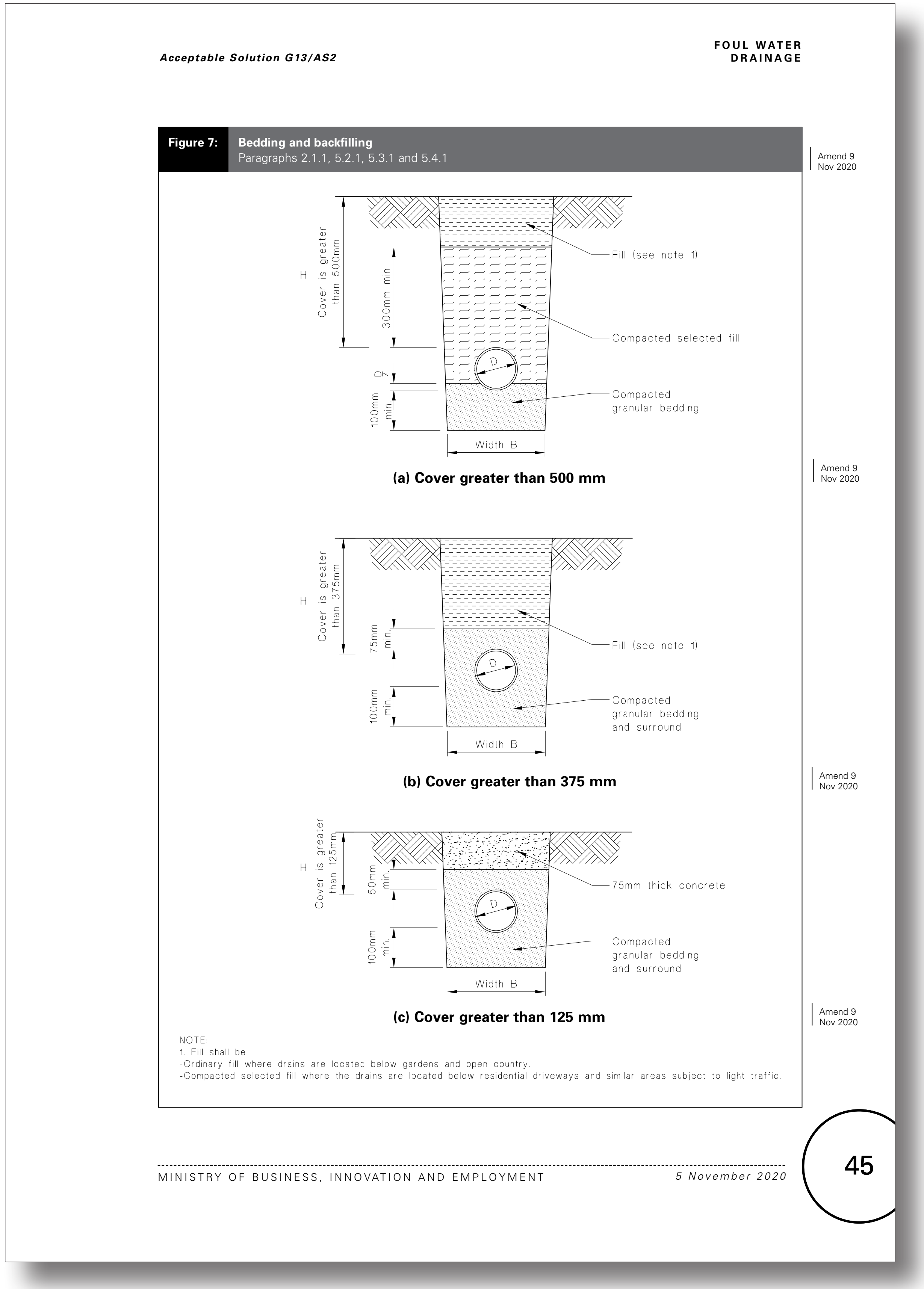

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FOUL WATER DRAINAGE

Figure 7: **Bedding and backfilling**
Paragraphs 2.1.1, 5.2.1, 5.3.1 and 5.4.1

Amend 9 Nov 2020

(a) Cover greater than 500 mm

Amend 9 Nov 2020

(b) Cover greater than 375 mm

Amend 9 Nov 2020

(c) Cover greater than 125 mm

Amend 9 Nov 2020

NOTE:
1. Fill shall be:
-Ordinary fill where drains are located below gardens and open country.
-Compacted selected fill where the drains are located below residential driveways and similar areas subject to light traffic.

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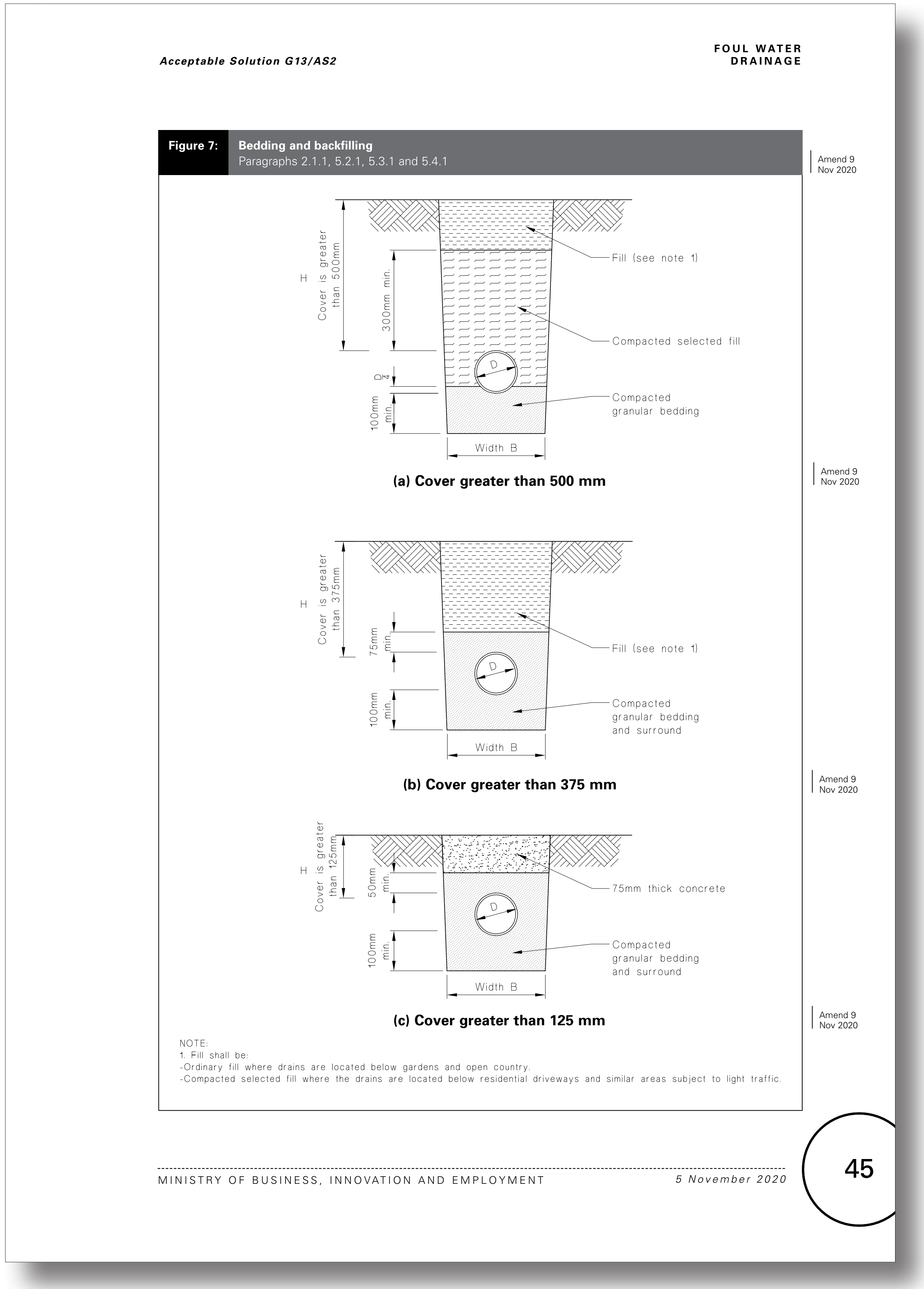

Acceptable Solution G13/AS2

FOUL WATER DRAINAGE

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Paragraphs 2.1.1, 5.2.1, 5.3.1 and 5.4.1

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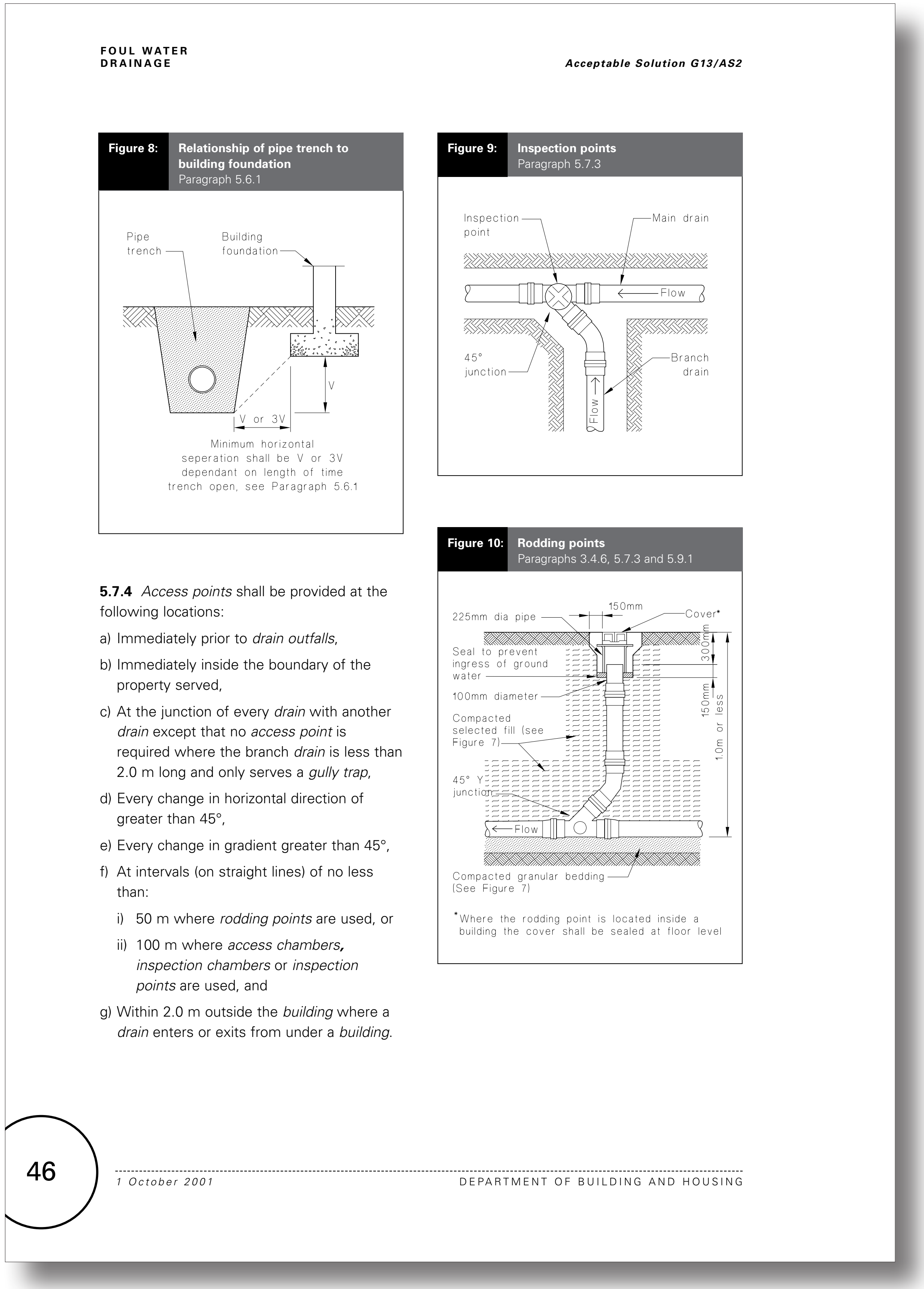

FOUL WATER DRAINAGE

Acceptable Solution G13/AS2

Figure 8: **Relationship of pipe trench to building foundation**
Paragraph 5.6.1

Figure 9: **Inspection points**
Paragraph 5.7.3

Figure 10: **Rodding points**
Paragraphs 3.4.6, 5.7.3 and 5.9.1

*Where the rodding point is located inside a building the cover shall be sealed at floor level

5.7.4 *Access points* shall be provided at the following locations:

a) Immediately prior to *drain outfalls*,

b) Immediately inside the boundary of the property served,

c) At the junction of every *drain* with another *drain* except that no *access point* is required where the branch *drain* is less than 2.0 m long and only serves a *gully trap*,

d) Every change in horizontal direction of greater than 45°,

e) Every change in gradient greater than 45°,

f) At intervals (on straight lines) of no less than:

  i) 50 m where *rodding points* are used, or

  ii) 100 m where *access chambers, inspection chambers* or *inspection points* are used, and

g) Within 2.0 m outside the *building* where a *drain* enters or exits from under a *building*.

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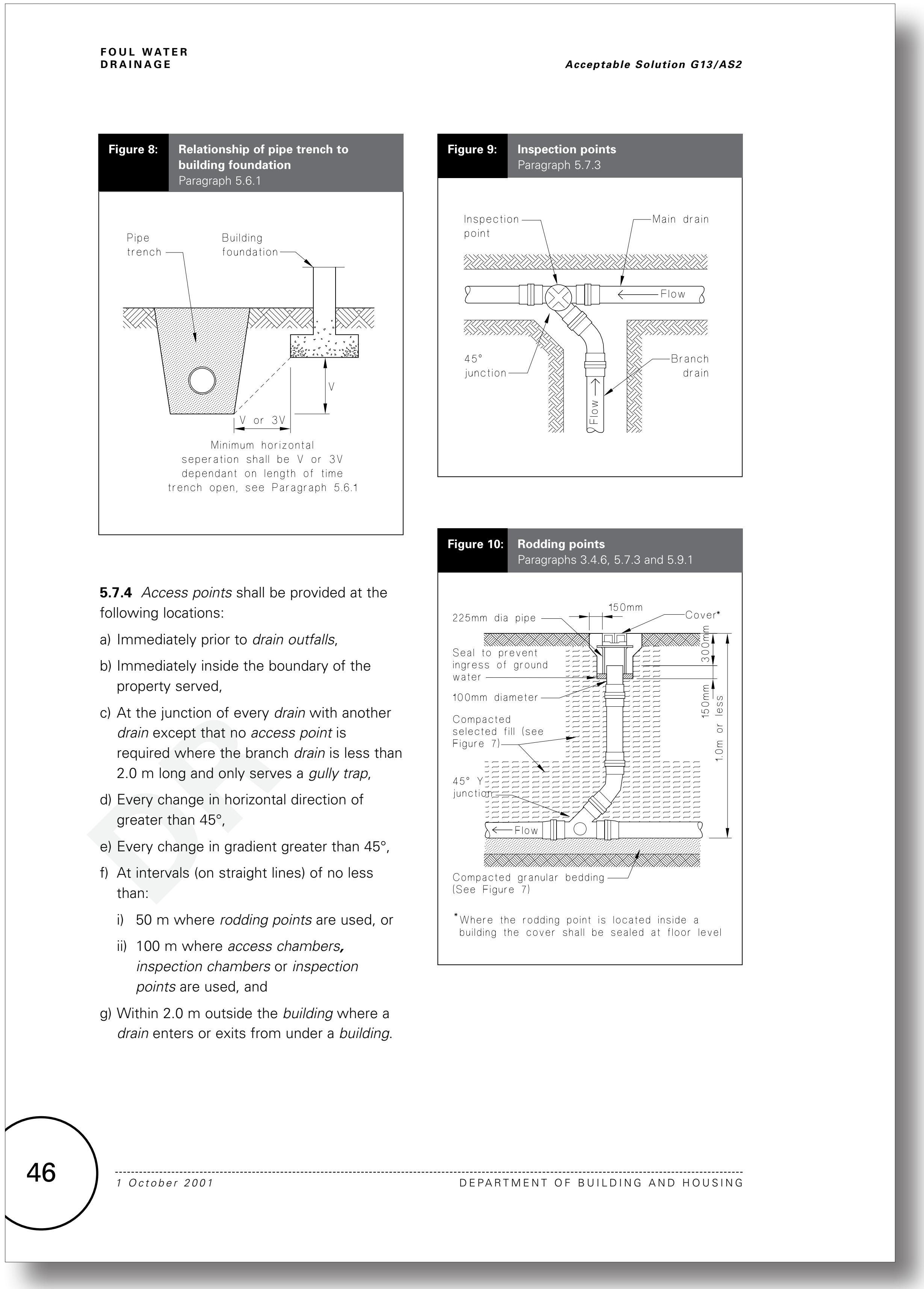

FOUL WATER DRAINAGE

Acceptable Solution G13/AS2

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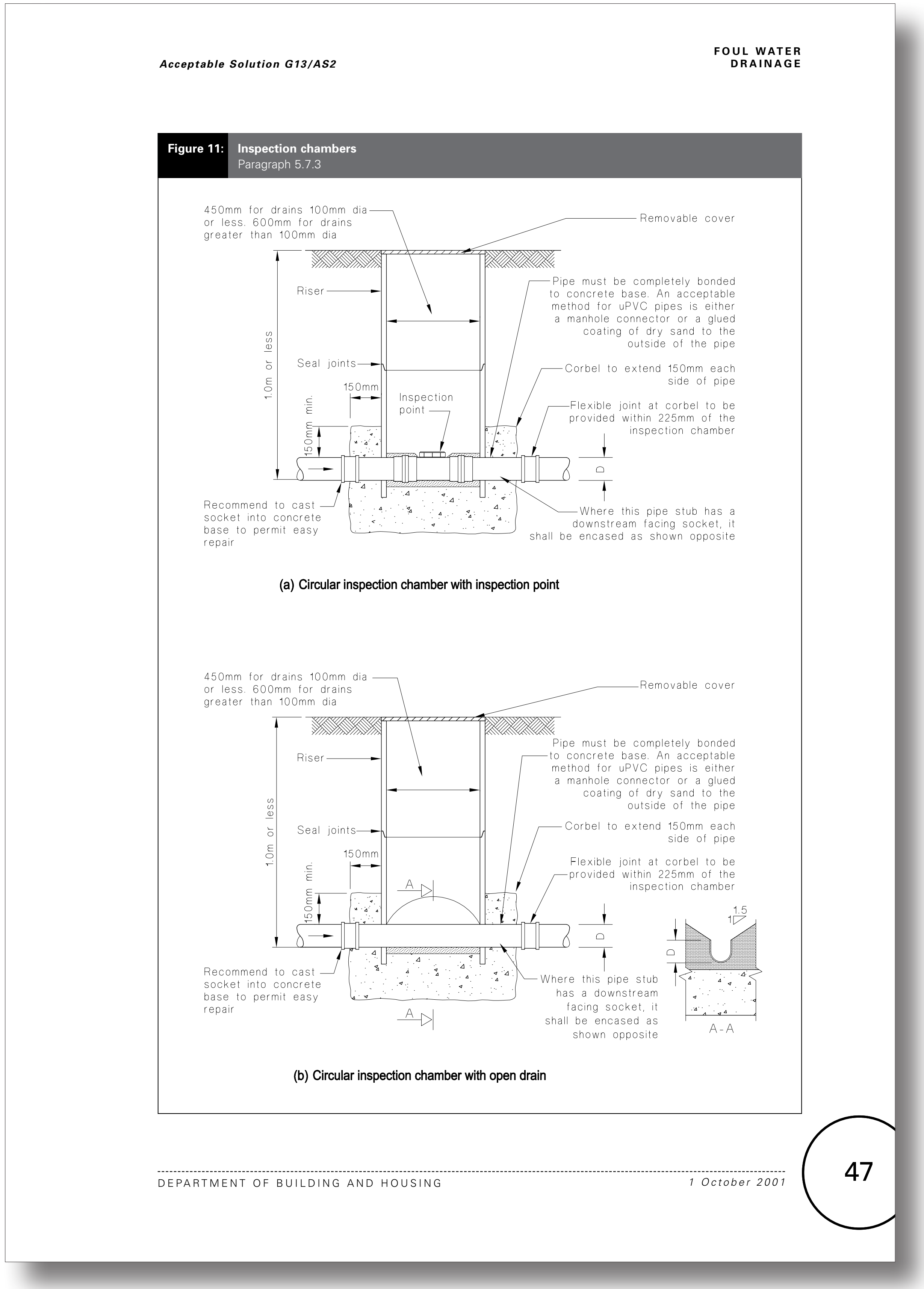

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FOUL WATER
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Figure 11: **Inspection chambers**
Paragraph 5.7.3

(a) Circular inspection chamber with inspection point

(b) Circular inspection chamber with open drain

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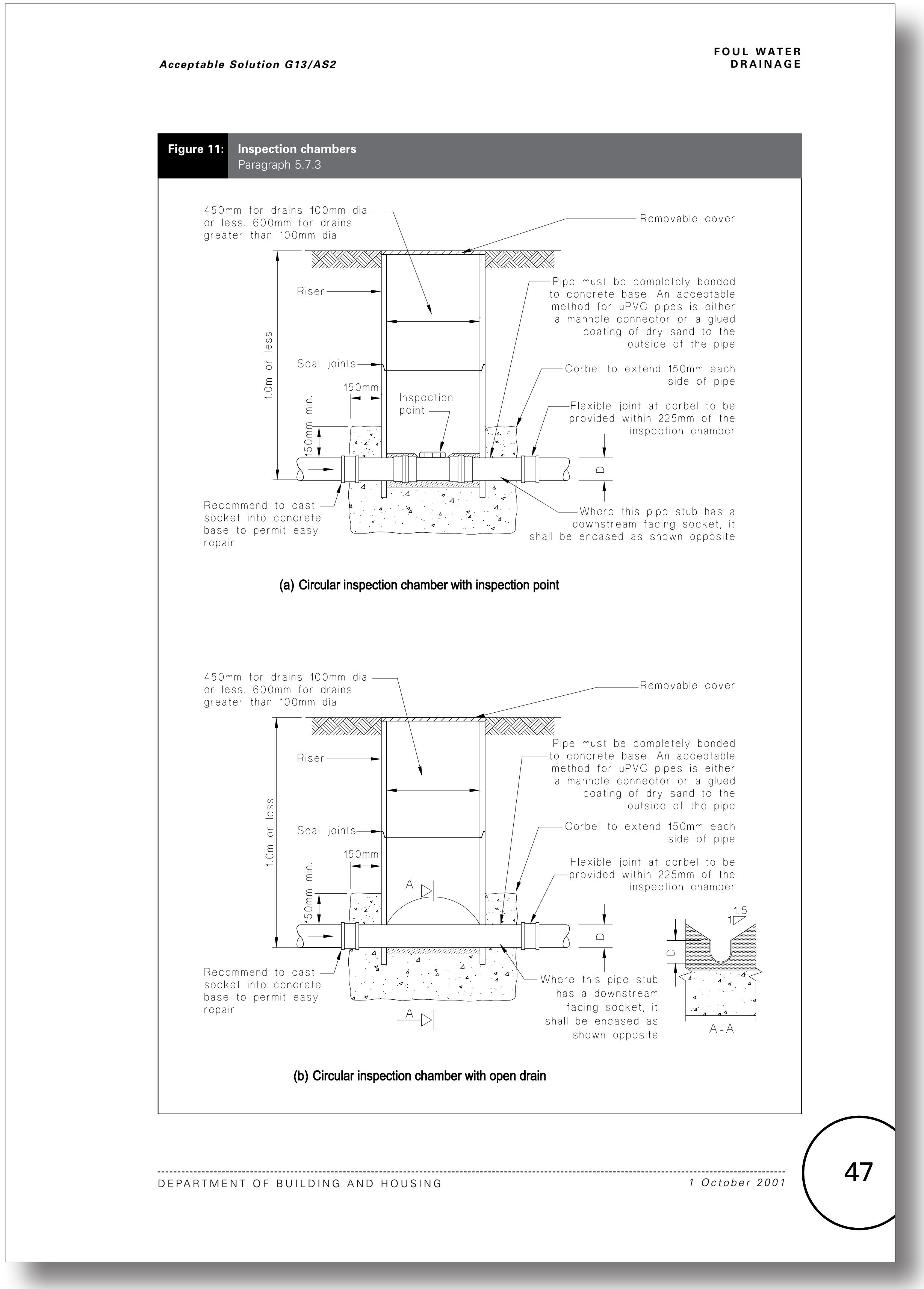

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FOUL WATER
DRAINAGE

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(b) Circular inspection chamber with open drain

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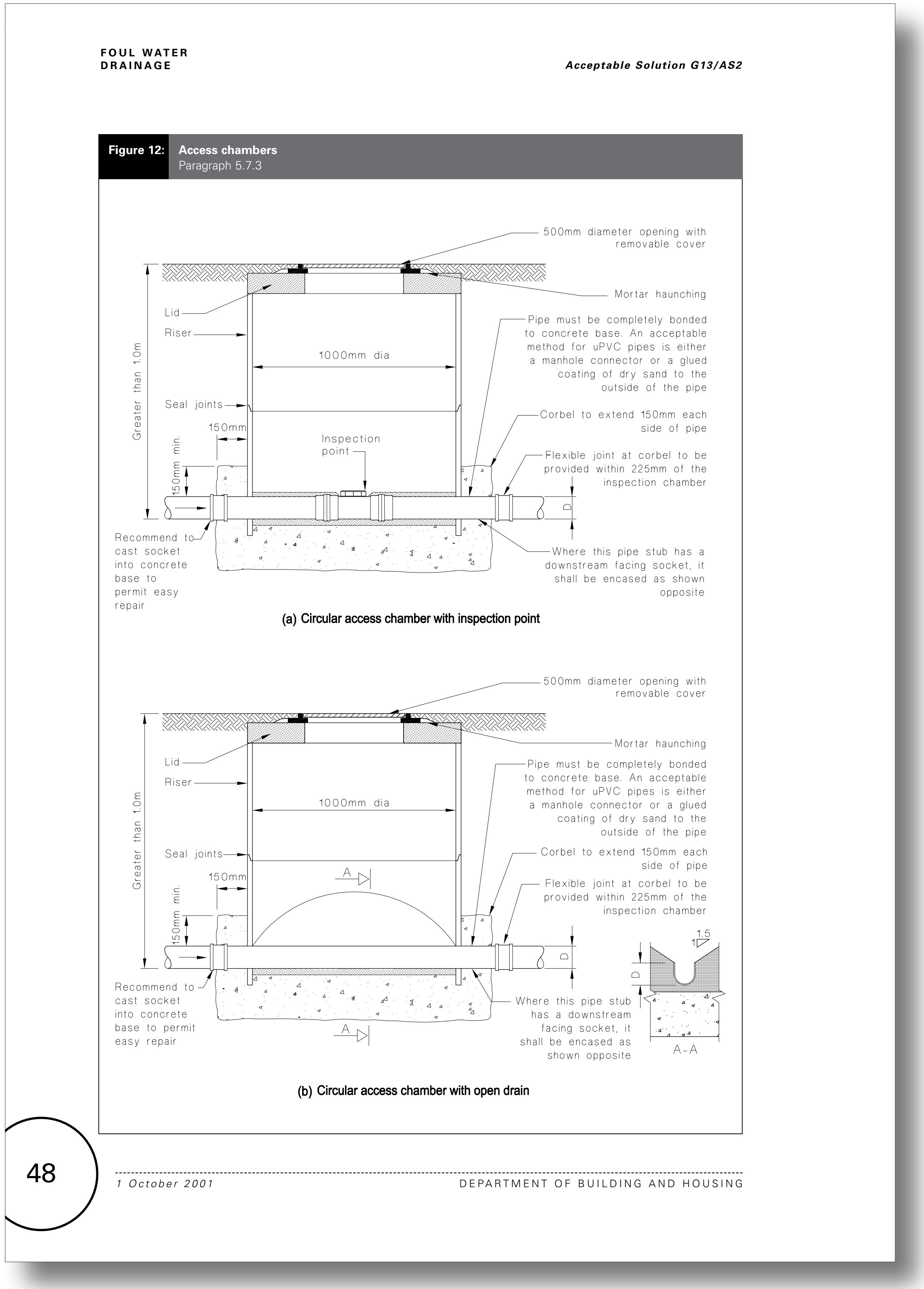

FOUL WATER DRAINAGE

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Figure 12: **Access chambers**
Paragraph 5.7.3

(a) Circular access chamber with inspection point

(b) Circular access chamber with open drain

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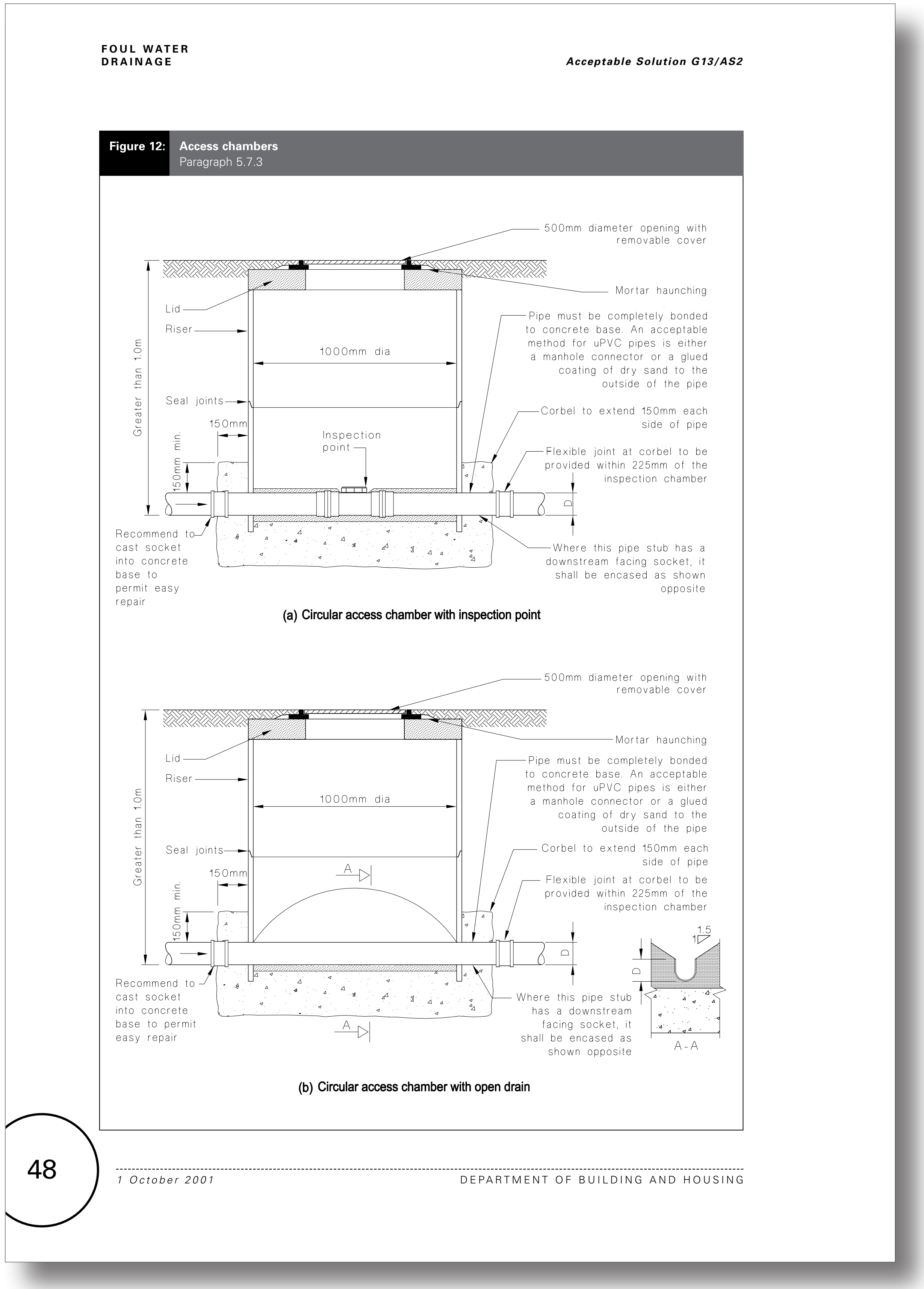

FOUL WATER DRAINAGE

Acceptable Solution G13/AS2

Figure 12: **Access chambers**
Paragraph 5.7.3

(a) Circular access chamber with inspection point

(b) Circular access chamber with open drain

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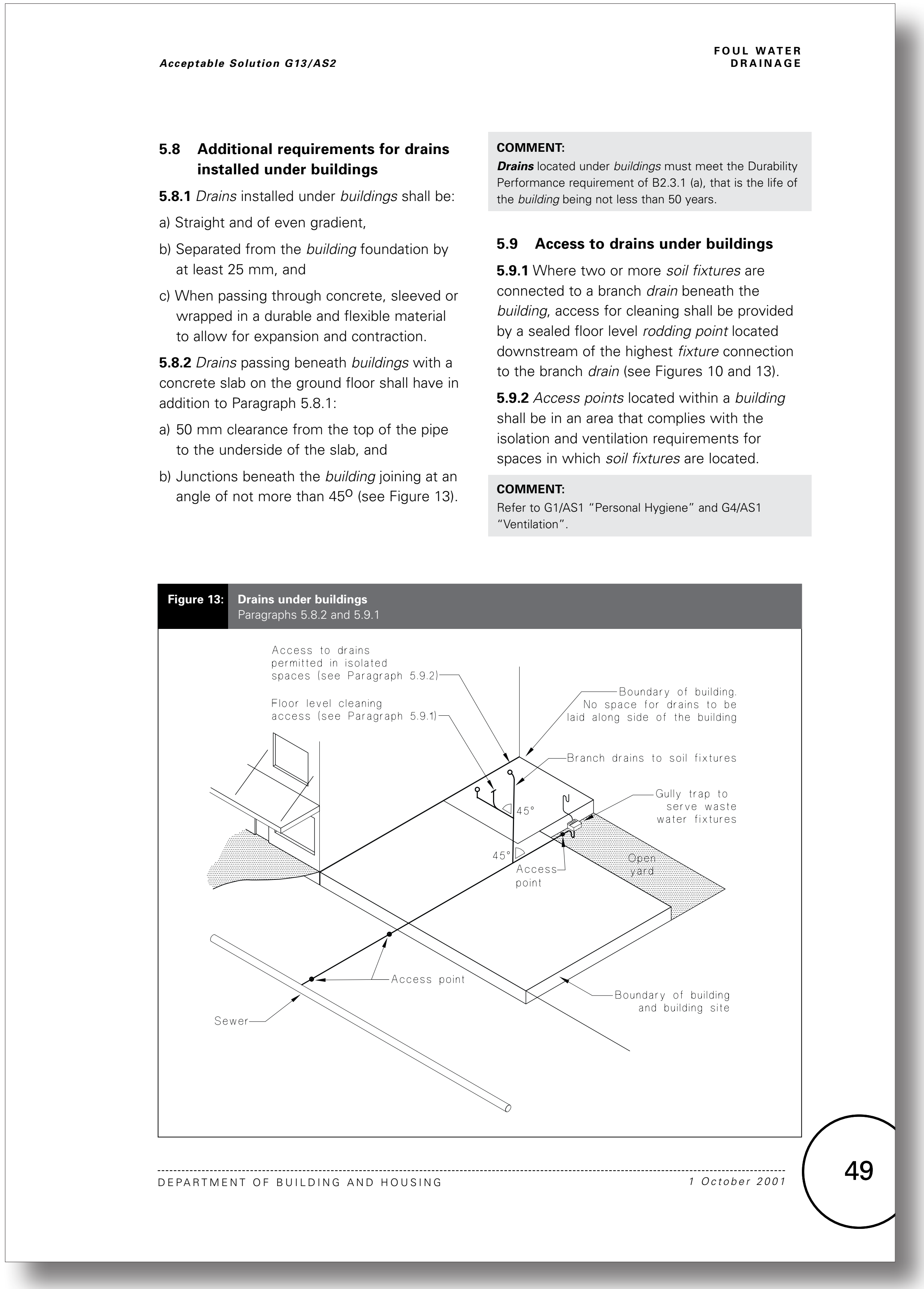

5.8 Additional requirements for drains installed under buildings

5.8.1 *Drains* installed under *buildings* shall be:

a) Straight and of even gradient,

b) Separated from the *building* foundation by at least 25 mm, and

c) When passing through concrete, sleeved or wrapped in a durable and flexible material to allow for expansion and contraction.

5.8.2 *Drains* passing beneath *buildings* with a concrete slab on the ground floor shall have in addition to Paragraph 5.8.1:

a) 50 mm clearance from the top of the pipe to the underside of the slab, and

b) Junctions beneath the *building* joining at an angle of not more than 45^{O} (see Figure 13).

COMMENT:
Drains located under *buildings* must meet the Durability Performance requirement of B2.3.1 (a), that is the life of the *building* being not less than 50 years.

5.9 Access to drains under buildings

5.9.1 Where two or more *soil fixtures* are connected to a branch *drain* beneath the *building*, access for cleaning shall be provided by a sealed floor level *rodding point* located downstream of the highest *fixture* connection to the branch *drain* (see Figures 10 and 13).

5.9.2 *Access points* located within a *building* shall be in an area that complies with the isolation and ventilation requirements for spaces in which *soil fixtures* are located.

COMMENT:
Refer to G1/AS1 "Personal Hygiene" and G4/AS1 "Ventilation".

Figure 13: **Drains under buildings**
Paragraphs 5.8.2 and 5.9.1

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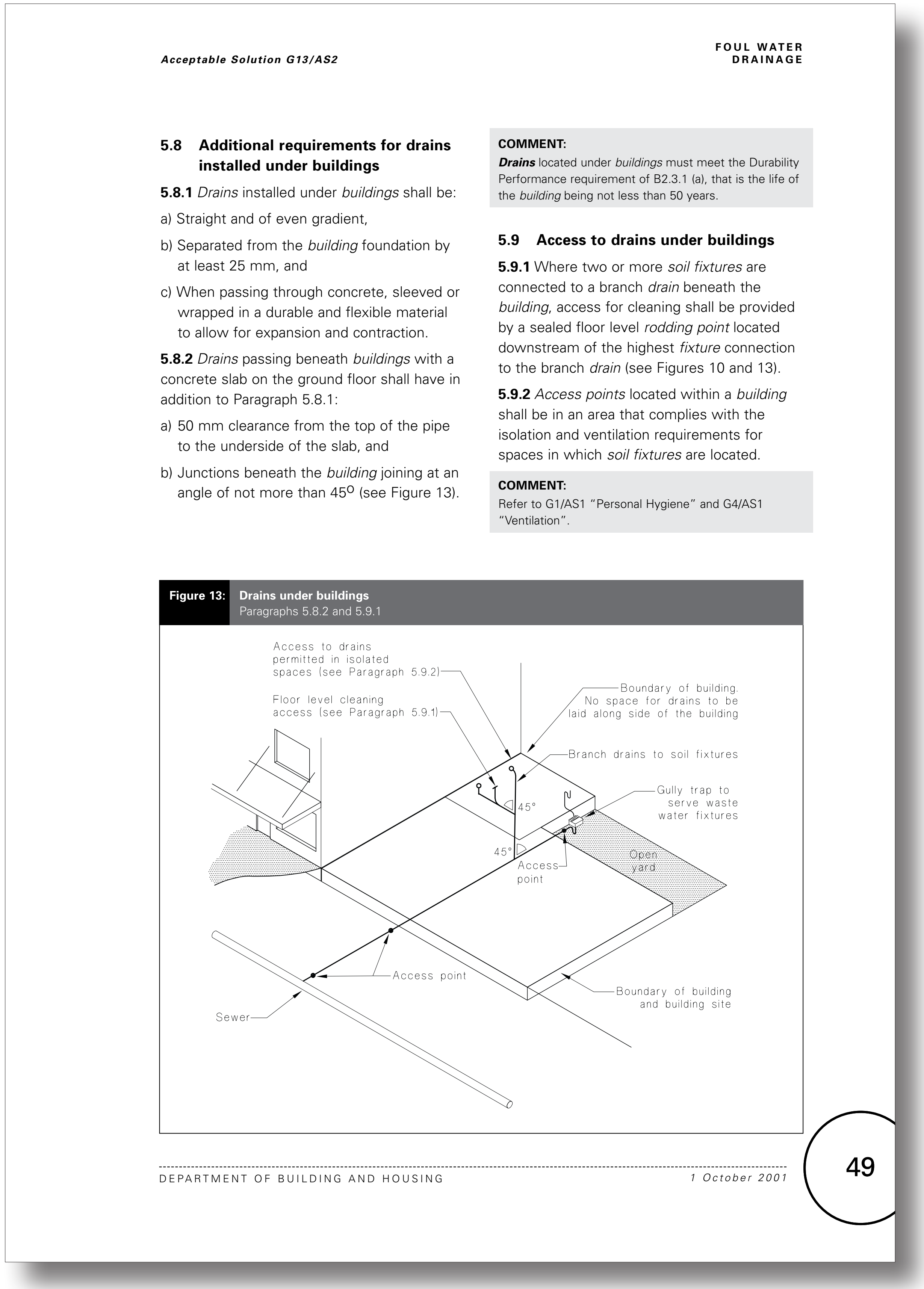


Acceptable Solution G13/AS2

FOUL WATER
DRAINAGE

5.8 Additional requirements for drains installed under buildings

5.8.1 *Drains* installed under *buildings* shall be:

a) Straight and of even gradient,

b) Separated from the *building* foundation by at least 25 mm, and

c) When passing through concrete, sleeved or wrapped in a durable and flexible material to allow for expansion and contraction.

5.8.2 *Drains* passing beneath *buildings* with a concrete slab on the ground floor shall have in addition to Paragraph 5.8.1:

a) 50 mm clearance from the top of the pipe to the underside of the slab, and

b) Junctions beneath the *building* joining at an angle of not more than 45^{O} (see Figure 13).

COMMENT:
Drains located under *buildings* must meet the Durability Performance requirement of B2.3.1 (a), that is the life of the *building* being not less than 50 years.

5.9 Access to drains under buildings

5.9.1 Where two or more *soil fixtures* are connected to a branch *drain* beneath the *building*, access for cleaning shall be provided by a sealed floor level *rodding point* located downstream of the highest *fixture* connection to the branch *drain* (see Figures 10 and 13).

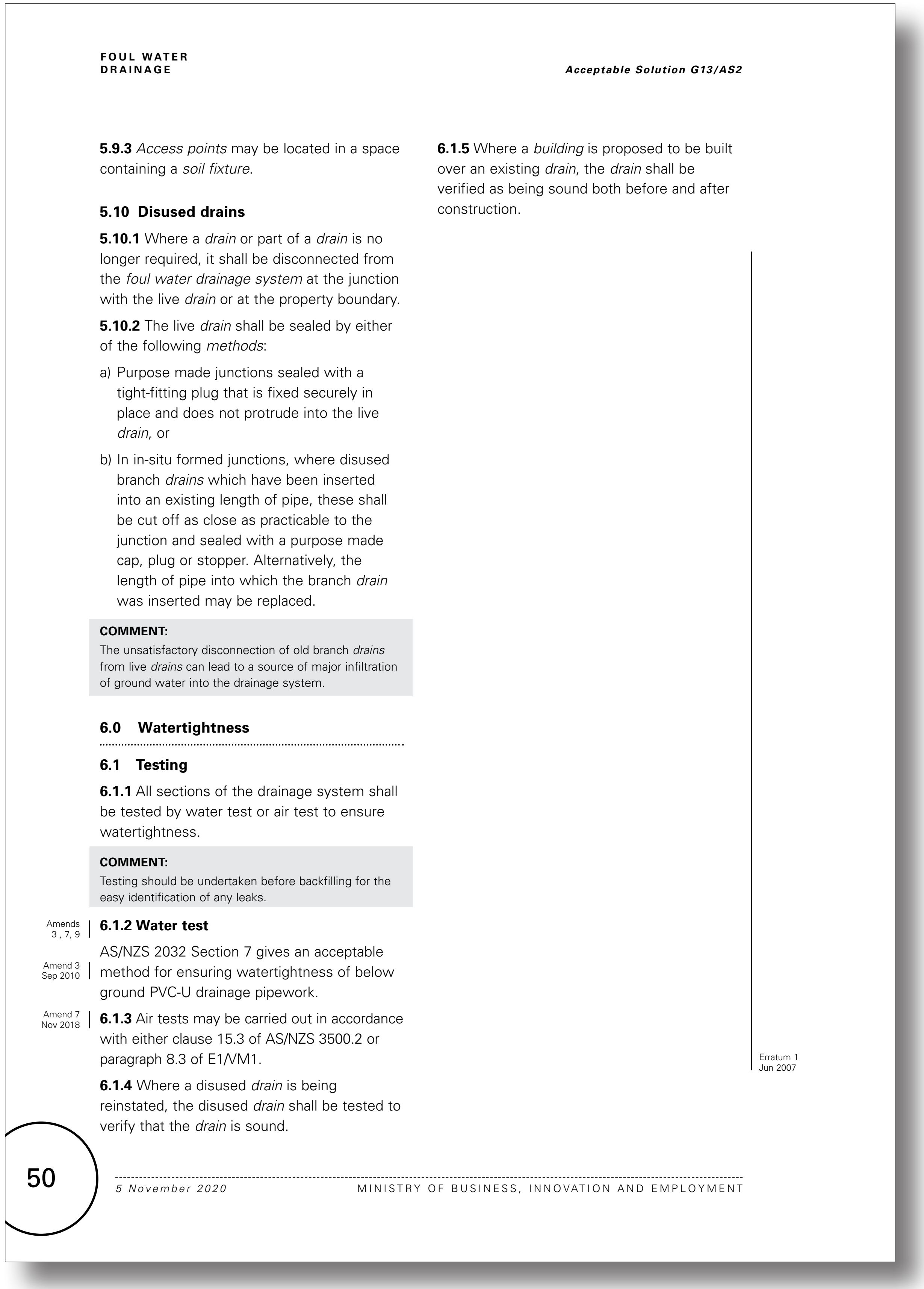
5.9.2 *Access points* located within a *building* shall be in an area that complies with the isolation and ventilation requirements for spaces in which *soil fixtures* are located.

COMMENT:
Refer to G1/AS1 "Personal Hygiene" and G4/AS1 "Ventilation".

Figure 13: **Drains under buildings**
Paragraphs 5.8.2 and 5.9.1

DEPARTMENT OF BUILDING AND HOUSING 1 October 2001 49

Current G13 Foul Water - No changes proposed to this page



5.9.3 *Access points* may be located in a space containing a *soil fixture.*

5.10 Disused drains

5.10.1 Where a *drain* or part of a *drain* is no longer required, it shall be disconnected from the *foul water drainage system* at the junction with the live *drain* or at the property boundary.

5.10.2 The live *drain* shall be sealed by either of the following *methods*:

a) Purpose made junctions sealed with a tight-fitting plug that is fixed securely in place and does not protrude into the live *drain*, or

b) In in-situ formed junctions, where disused branch *drains* which have been inserted into an existing length of pipe, these shall be cut off as close as practicable to the junction and sealed with a purpose made cap, plug or stopper. Alternatively, the length of pipe into which the branch *drain* was inserted may be replaced.

COMMENT:
The unsatisfactory disconnection of old branch *drains* from live *drains* can lead to a source of major infiltration of ground water into the drainage system.

6.0 Watertightness

6.1 Testing

6.1.1 All sections of the drainage system shall be tested by water test or air test to ensure watertightness.

COMMENT:
Testing should be undertaken before backfilling for the easy identification of any leaks.

Amends 3, 7, 9 **6.1.2 Water test**

Amend 3 Sep 2010 AS/NZS 2032 Section 7 gives an acceptable method for ensuring watertightness of below ground PVC-U drainage pipework.

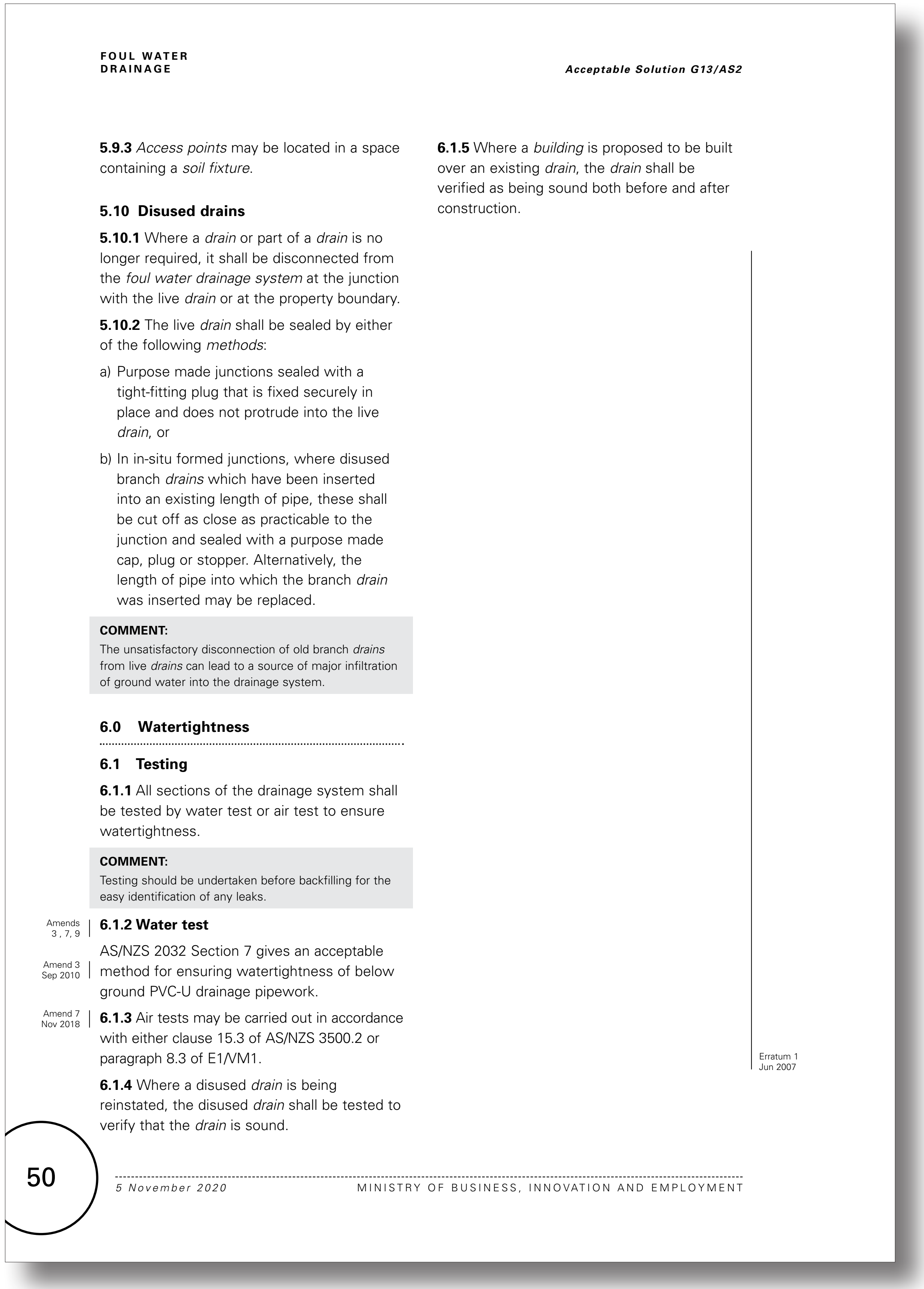
Amend 7 Nov 2018 **6.1.3** Air tests may be carried out in accordance with either clause 15.3 of AS/NZS 3500.2 or paragraph 8.3 of E1/VM1.

6.1.4 Where a disused *drain* is being reinstated, the disused *drain* shall be tested to verify that the *drain* is sound.

6.1.5 Where a *building* is proposed to be built over an existing *drain*, the *drain* shall be verified as being sound both before and after construction.

Erratum 1 Jun 2007

Proposed G13 Foul Water - No changes proposed to this page



FOUL WATER
DRAINAGE

Acceptable Solution G13/AS2

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COMMENT:
The unsatisfactory disconnection of old branch *drains* from live *drains* can lead to a source of major infiltration of ground water into the drainage system.

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COMMENT:
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Amends 3, 7, 9 **6.1.2 Water test**

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Erratum 1 Jun 2007

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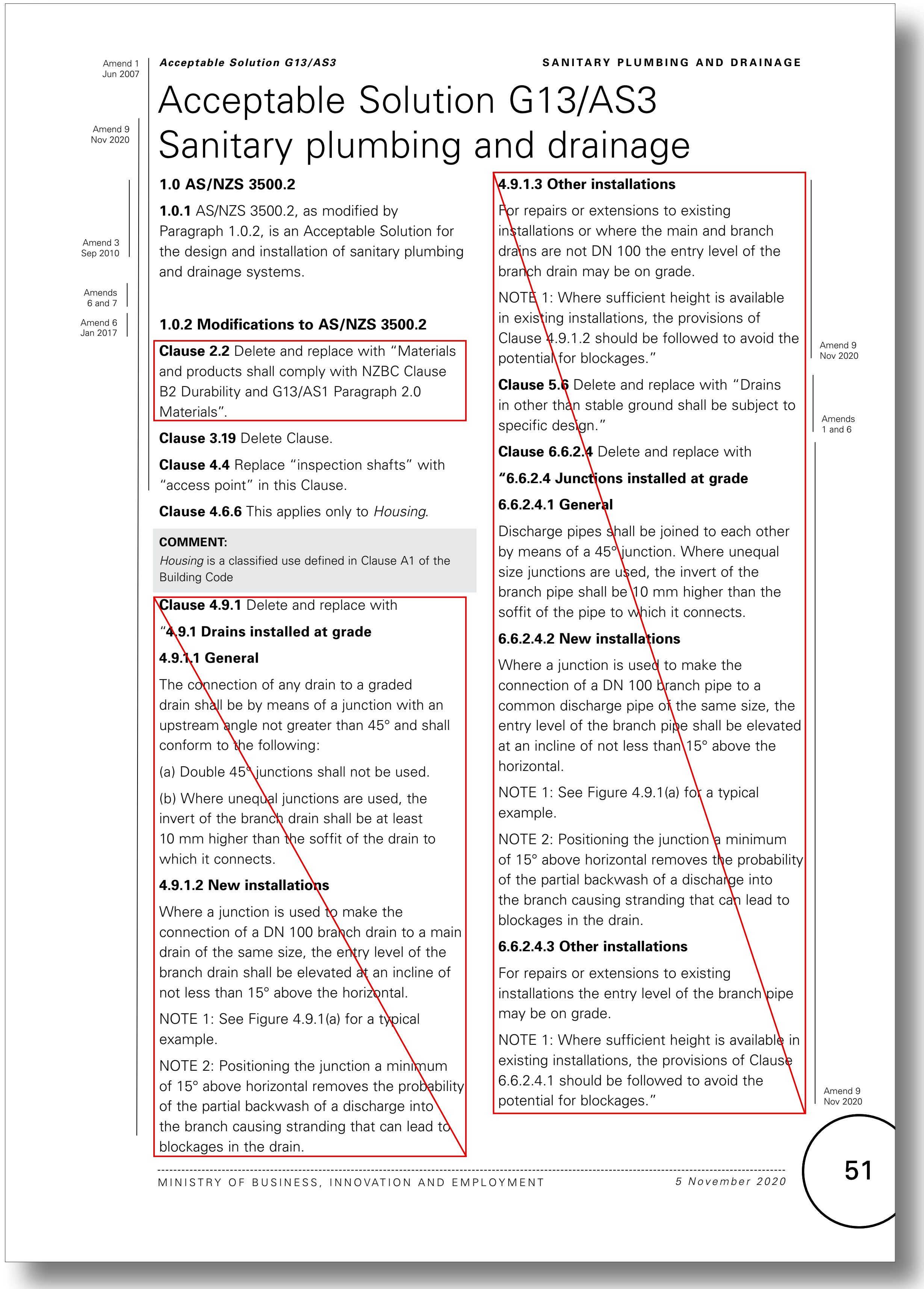
5 November 2020 MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Current G13 Foul Water acceptable solutions and verification methods

(Text to be amended shown in red)



Amend 1 Jun 2007

Acceptable Solution G13/AS3

SANITARY PLUMBING AND DRAINAGE

Amend 9 Nov 2020

Acceptable Solution G13/AS3
Sanitary plumbing and drainage

1.0 AS/NZS 3500.2

Amend 3 Sep 2010

1.0.1 AS/NZS 3500.2, as modified by Paragraph 1.0.2, is an Acceptable Solution for the design and installation of sanitary plumbing and drainage systems.

Amends 6 and 7

Amend 6 Jan 2017

1.0.2 Modifications to AS/NZS 3500.2

Clause 2.2 Delete and replace with "Materials and products shall comply with NZBC Clause B2 Durability and G13/AS1 Paragraph 2.0 Materials".

Clause 3.19 Delete Clause.

Clause 4.4 Replace "inspection shafts" with "access point" in this Clause.

Clause 4.6.6 This applies only to *Housing*.

COMMENT:
Housing is a classified use defined in Clause A1 of the Building Code

~~**Clause 4.9.1** Delete and replace with~~

~~**"4.9.1 Drains installed at grade**~~

~~**4.9.1.1 General**~~

~~The connection of any drain to a graded drain shall be by means of a junction with an upstream angle not greater than 45° and shall conform to the following:~~

~~(a) Double 45° junctions shall not be used.~~

~~(b) Where unequal junctions are used, the invert of the branch drain shall be at least 10 mm higher than the soffit of the drain to which it connects.~~

~~**4.9.1.2 New installations**~~

~~Where a junction is used to make the connection of a DN 100 branch drain to a main drain of the same size, the entry level of the branch drain shall be elevated at an incline of not less than 15° above the horizontal.~~

~~NOTE 1: See Figure 4.9.1(a) for a typical example.~~

~~NOTE 2: Positioning the junction a minimum of 15° above horizontal removes the probability of the partial backwash of a discharge into the branch causing stranding that can lead to blockages in the drain.~~

~~**4.9.1.3 Other installations**~~

~~For repairs or extensions to existing installations or where the main and branch drains are not DN 100 the entry level of the branch drain may be on grade.~~

~~NOTE 1: Where sufficient height is available in existing installations, the provisions of Clause 4.9.1.2 should be followed to avoid the potential for blockages."~~

Amend 9 Nov 2020

~~**Clause 5.6** Delete and replace with "Drains in other than stable ground shall be subject to specific design."~~

Amends 1 and 6

~~**Clause 6.6.2.4** Delete and replace with~~

~~**"6.6.2.4 Junctions installed at grade**~~

~~**6.6.2.4.1 General**~~

~~Discharge pipes shall be joined to each other by means of a 45° junction. Where unequal size junctions are used, the invert of the branch pipe shall be 10 mm higher than the soffit of the pipe to which it connects.~~

~~**6.6.2.4.2 New installations**~~

~~Where a junction is used to make the connection of a DN 100 branch pipe to a common discharge pipe of the same size, the entry level of the branch pipe shall be elevated at an incline of not less than 15° above the horizontal.~~

~~NOTE 1: See Figure 4.9.1(a) for a typical example.~~

~~NOTE 2: Positioning the junction a minimum of 15° above horizontal removes the probability of the partial backwash of a discharge into the branch causing stranding that can lead to blockages in the drain.~~

~~**6.6.2.4.3 Other installations**~~

~~For repairs or extensions to existing installations the entry level of the branch pipe may be on grade.~~

~~NOTE 1: Where sufficient height is available in existing installations, the provisions of Clause 6.6.2.4.1 should be followed to avoid the potential for blockages."~~

Amend 9 Nov 2020

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

5 November 2020

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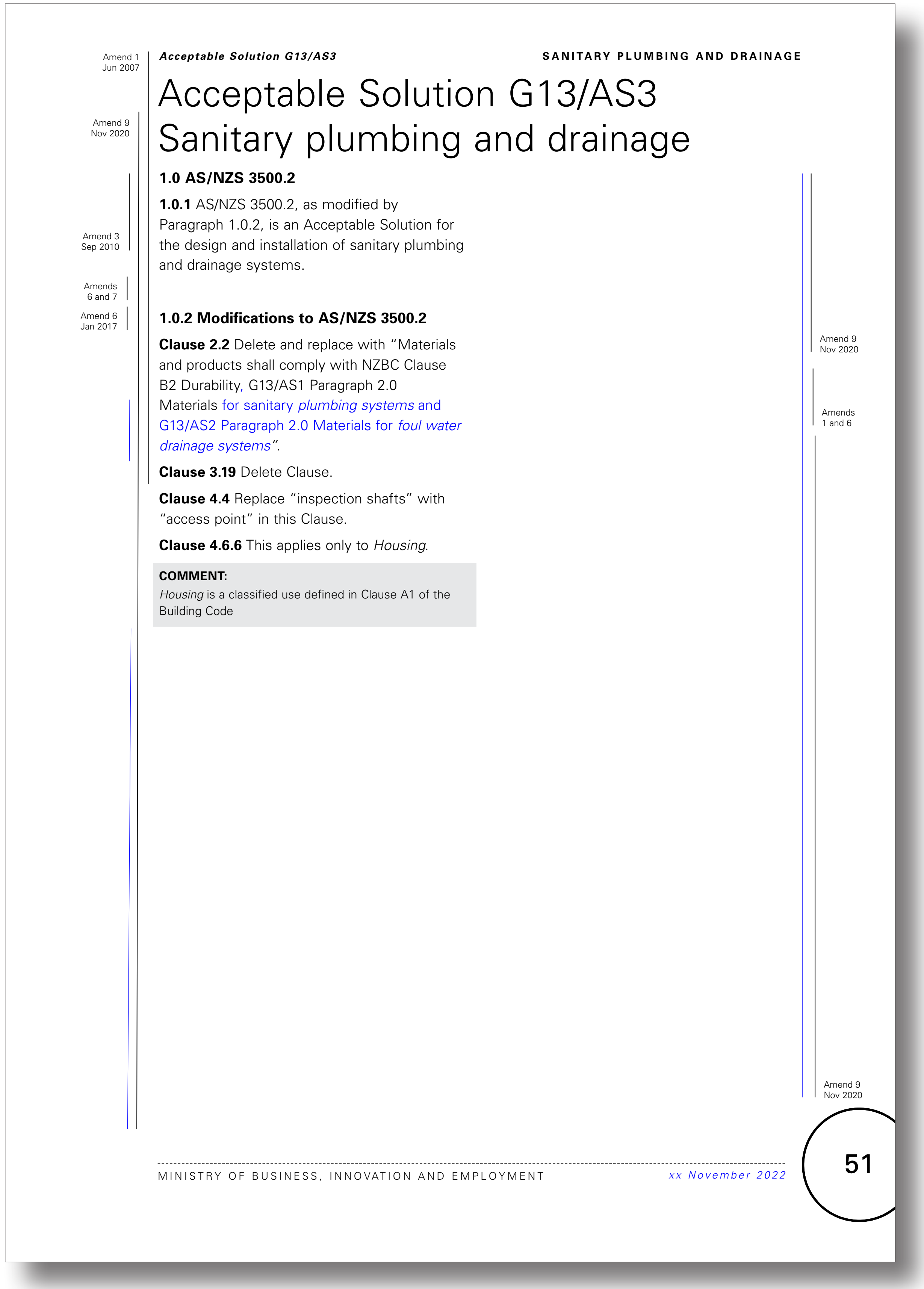
Proposed amendments to G13 Foul Water acceptable solutions and verification methods (Proposed text in blue)



Amend 1 Jun 2007

Acceptable Solution G13/AS3

SANITARY PLUMBING AND DRAINAGE

Amend 9 Nov 2020

Acceptable Solution G13/AS3
Sanitary plumbing and drainage

1.0 AS/NZS 3500.2

Amend 3 Sep 2010

1.0.1 AS/NZS 3500.2, as modified by Paragraph 1.0.2, is an Acceptable Solution for the design and installation of sanitary plumbing and drainage systems.

Amends 6 and 7

Amend 6 Jan 2017

1.0.2 Modifications to AS/NZS 3500.2

Amend 9 Nov 2020

Clause 2.2 Delete and replace with "Materials and products shall comply with NZBC Clause B2 Durability, G13/AS1 Paragraph 2.0 Materials for sanitary *plumbing systems* and G13/AS2 Paragraph 2.0 Materials for *foul water drainage systems*".

Amends 1 and 6

Clause 3.19 Delete Clause.

Clause 4.4 Replace "inspection shafts" with "access point" in this Clause.

Clause 4.6.6 This applies only to *Housing*.

COMMENT:
Housing is a classified use defined in Clause A1 of the Building Code

Amend 9 Nov 2020

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

xx November 2022

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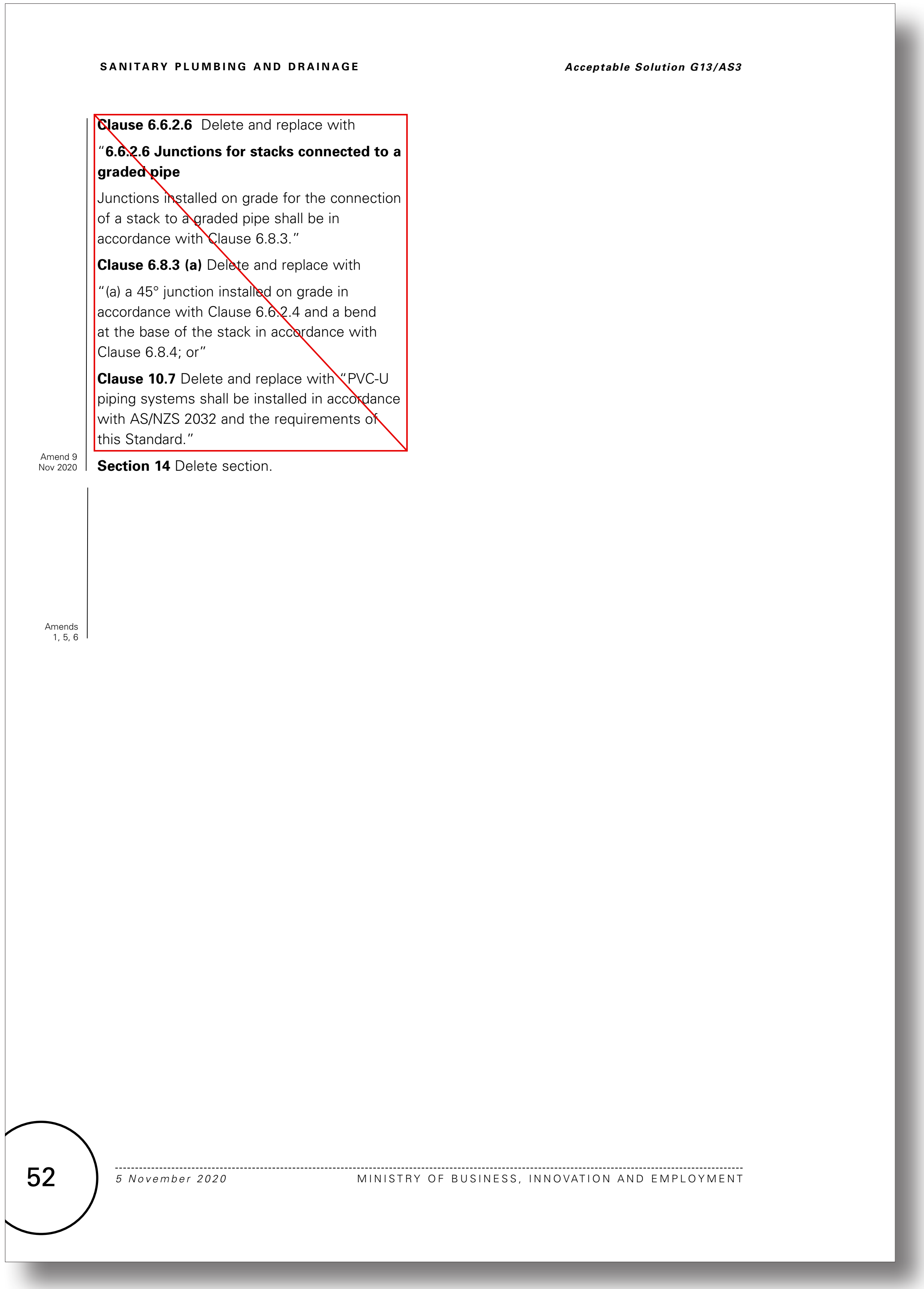
Current G13 Foul Water acceptable solutions and verification methods

(Text to be amended shown in red)



SANITARY PLUMBING AND DRAINAGE

Acceptable Solution G13/AS3

~~**Clause 6.6.2.6** Delete and replace with~~

~~"**6.6.2.6 Junctions for stacks connected to a graded pipe**~~

~~Junctions installed on grade for the connection of a stack to a graded pipe shall be in accordance with Clause 6.8.3."~~

~~**Clause 6.8.3 (a)** Delete and replace with~~

~~"(a) a 45° junction installed on grade in accordance with Clause 6.6.2.4 and a bend at the base of the stack in accordance with Clause 6.8.4; or"~~

~~**Clause 10.7** Delete and replace with "PVC-U piping systems shall be installed in accordance with AS/NZS 2032 and the requirements of this Standard."~~

Amend 9 Nov 2020

Section 14 Delete section.

Amends 1, 5, 6

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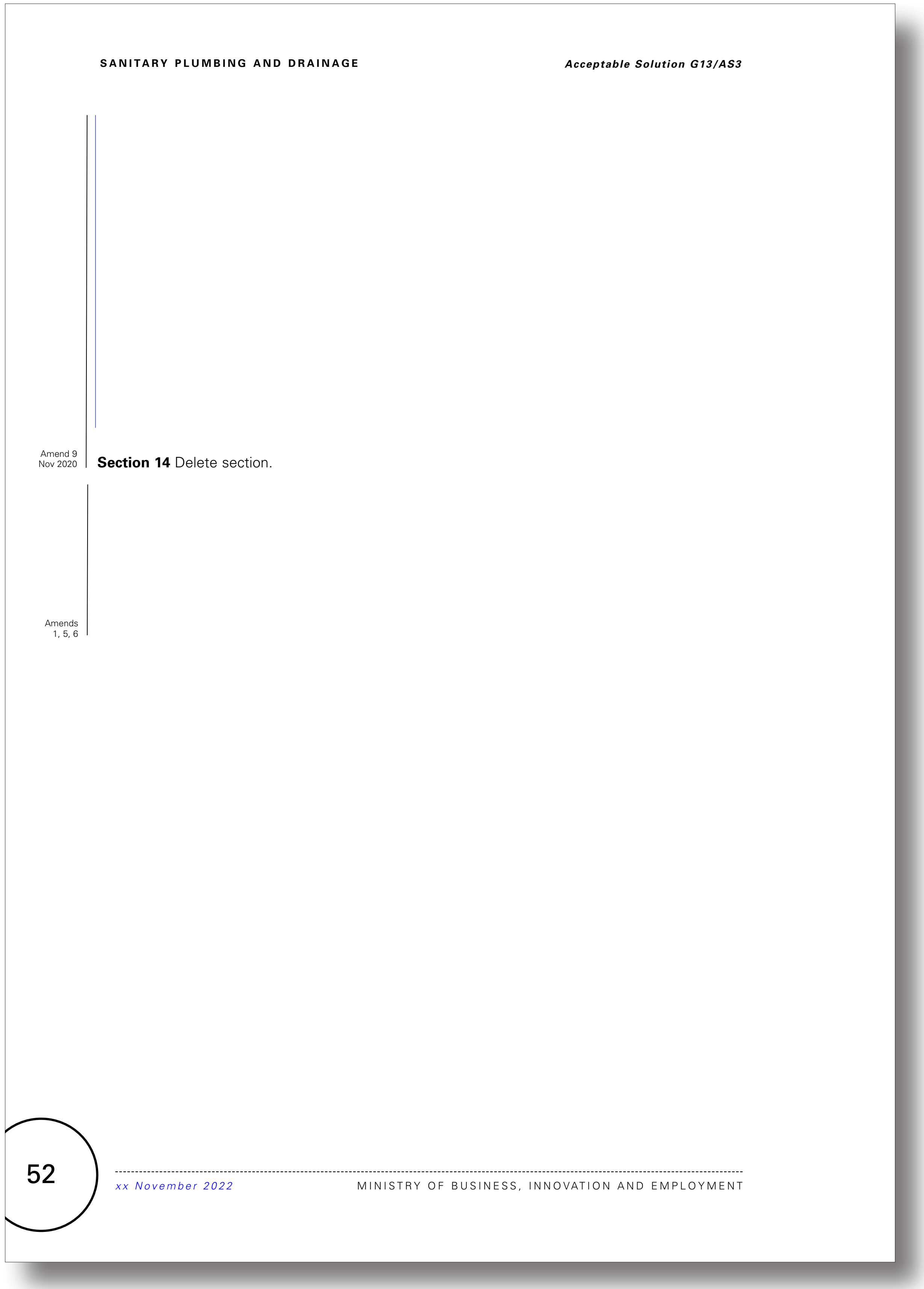
5 November 2020

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Proposed amendments to G13 Foul Water acceptable solutions and verification methods

(Proposed text in blue)



SANITARY PLUMBING AND DRAINAGE

Acceptable Solution G13/AS3

Amend 9 Nov 2020

Section 14 Delete section.

Amends 1, 5, 6

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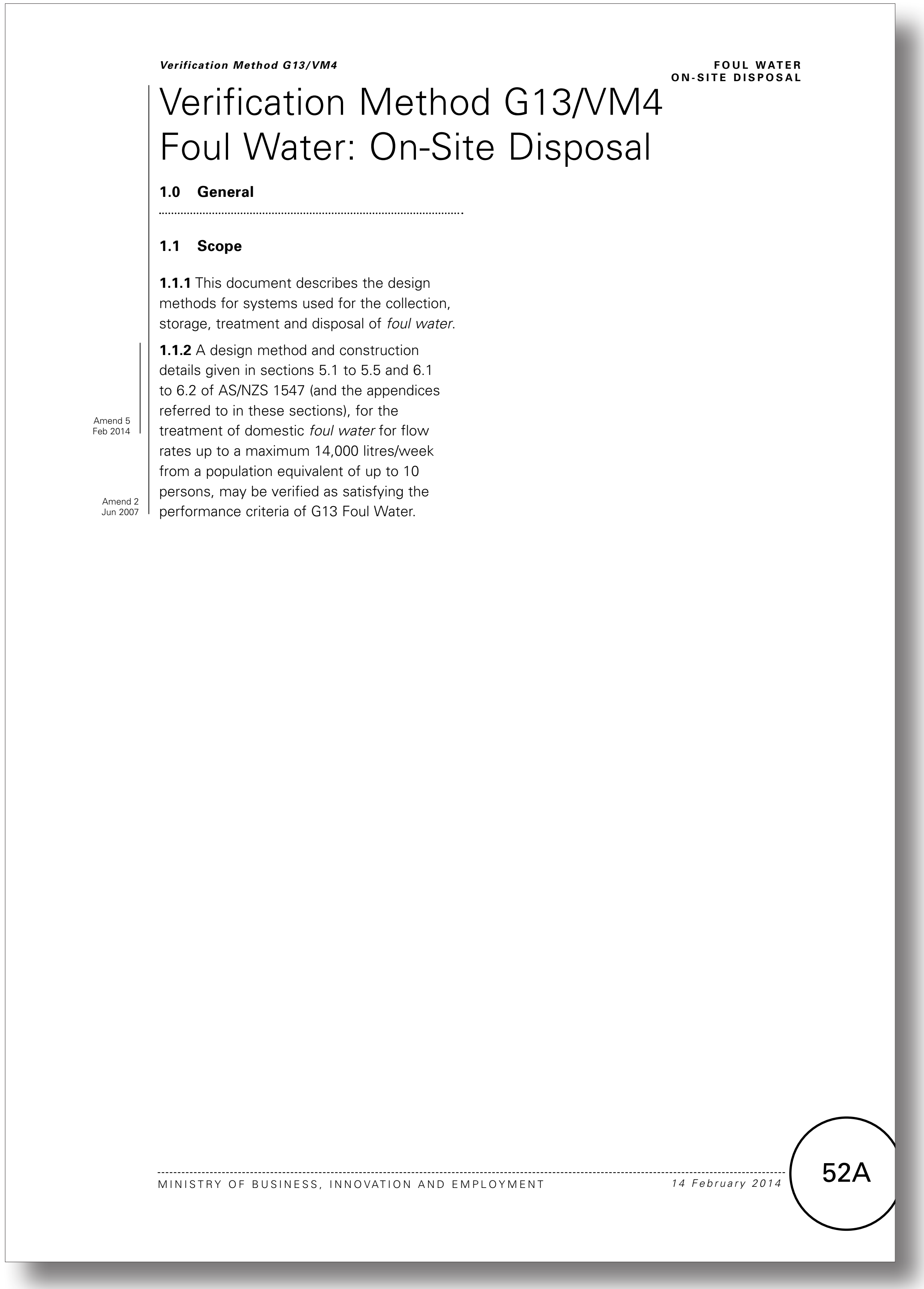
xx November 2022

MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT

Current G13 Foul Water - No changes proposed to this page



Verification Method G13/VM4 Foul Water: On-Site Disposal

1.0 General

1.1 Scope

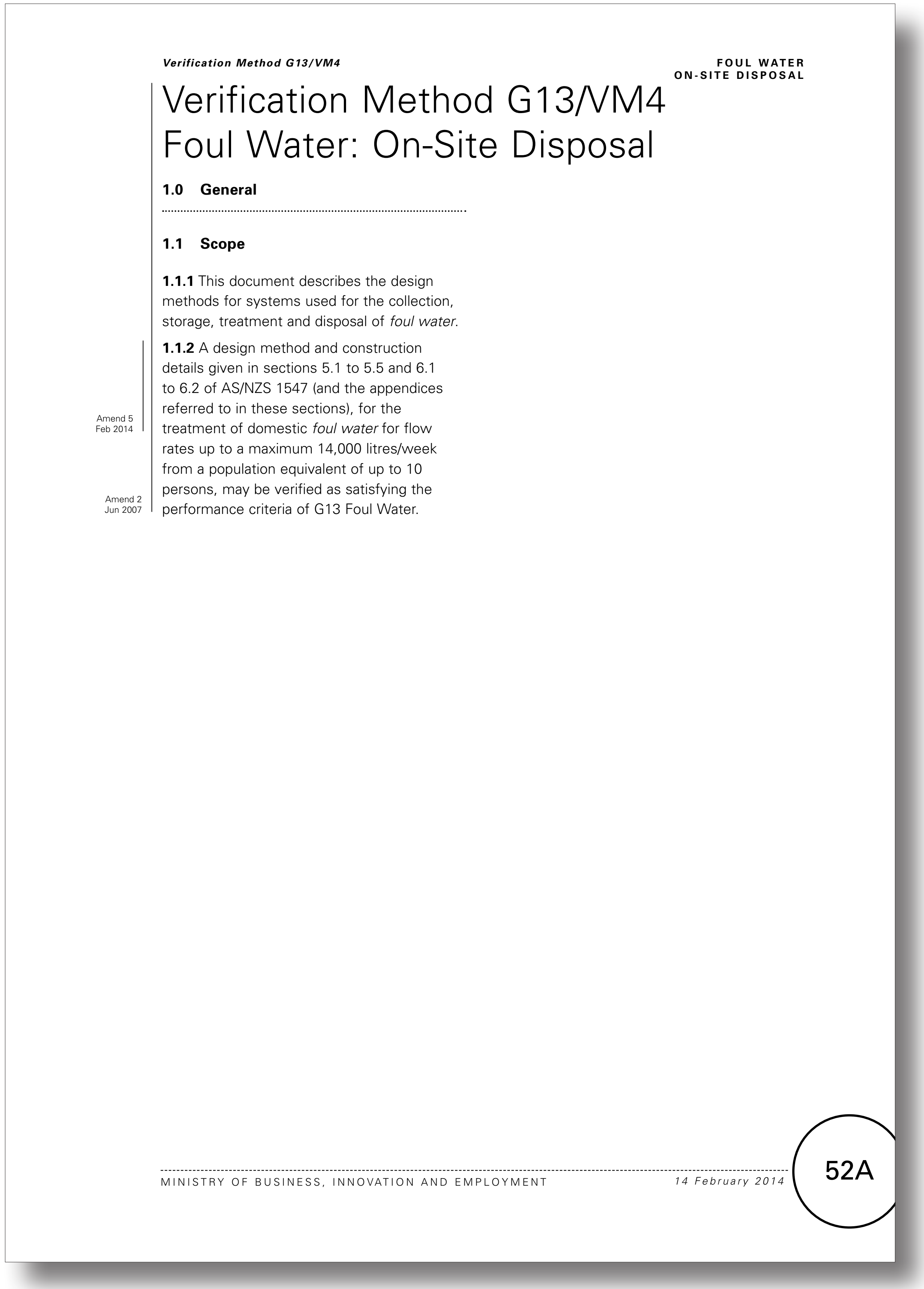
1.1.1 This document describes the design methods for systems used for the collection, storage, treatment and disposal of *foul water*.

Amend 5
Feb 2014

1.1.2 A design method and construction details given in sections 5.1 to 5.5 and 6.1 to 6.2 of AS/NZS 1547 (and the appendices referred to in these sections), for the treatment of domestic *foul water* for flow rates up to a maximum 14,000 litres/week from a population equivalent of up to 10 persons, may be verified as satisfying the performance criteria of G13 Foul Water.

Amend 2
Jun 2007

Proposed G13 Foul Water - No changes proposed to this page



Verification Method G13/VM4

FOUL WATER
ON-SITE DISPOSAL

Verification Method G13/VM4 Foul Water: On-Site Disposal

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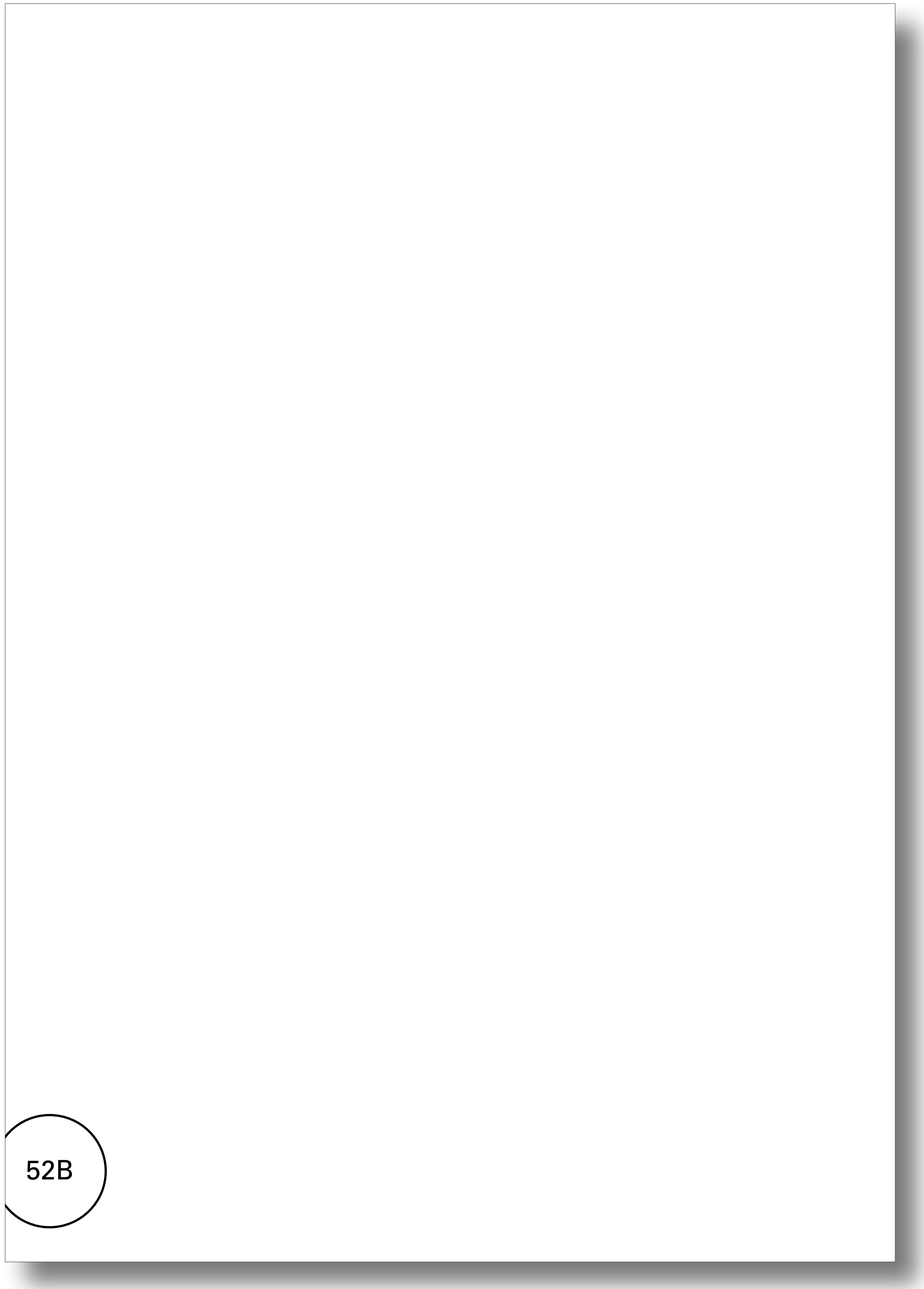
Amend 2
Jun 2007

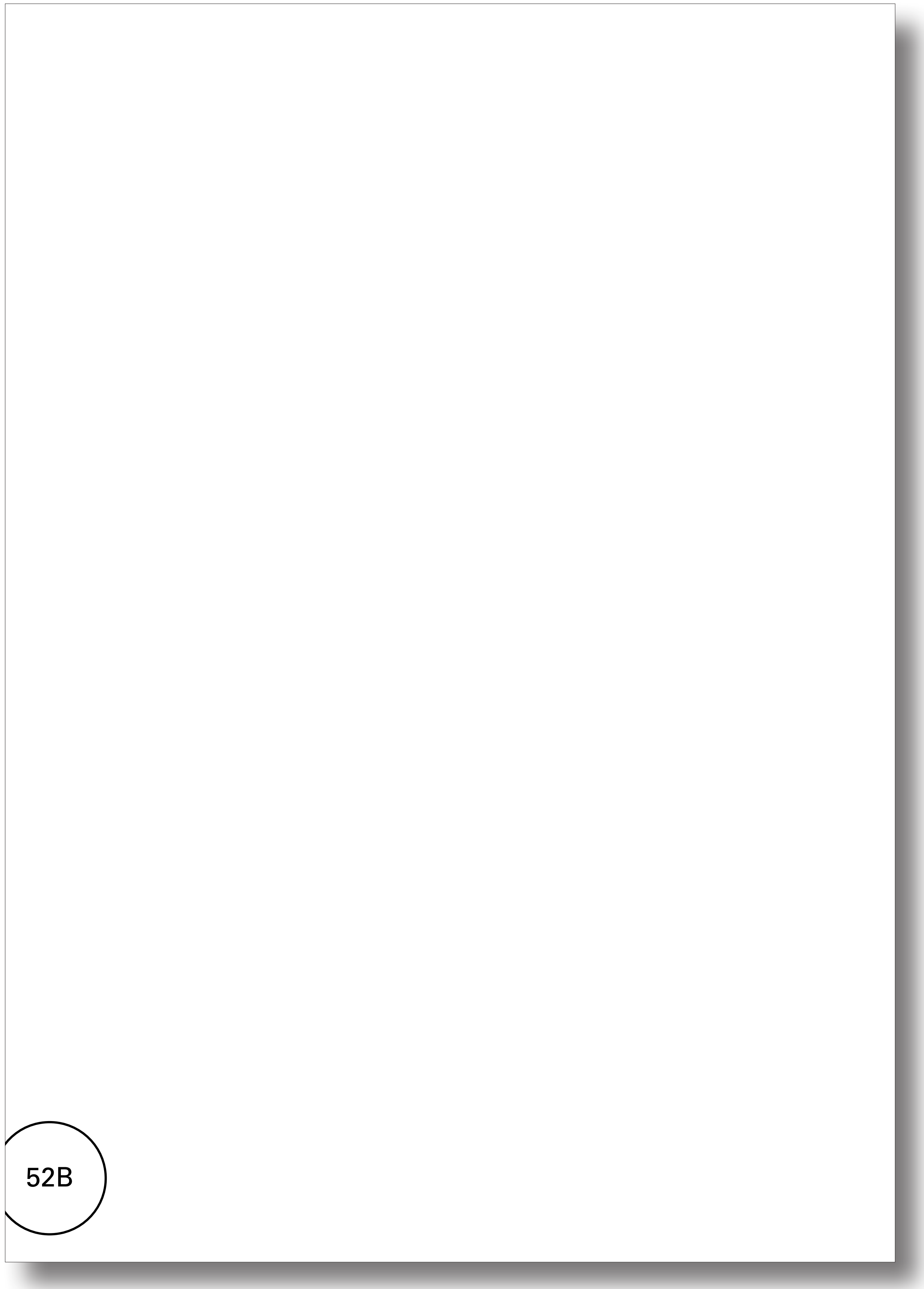
MINISTRY OF BUSINESS, INNOVATION AND EMPLOYMENT
14 February 2014
52A

Current G13 Foul Water - No changes proposed to this page



52B

Proposed G13 Foul Water - No changes proposed to this page



52B

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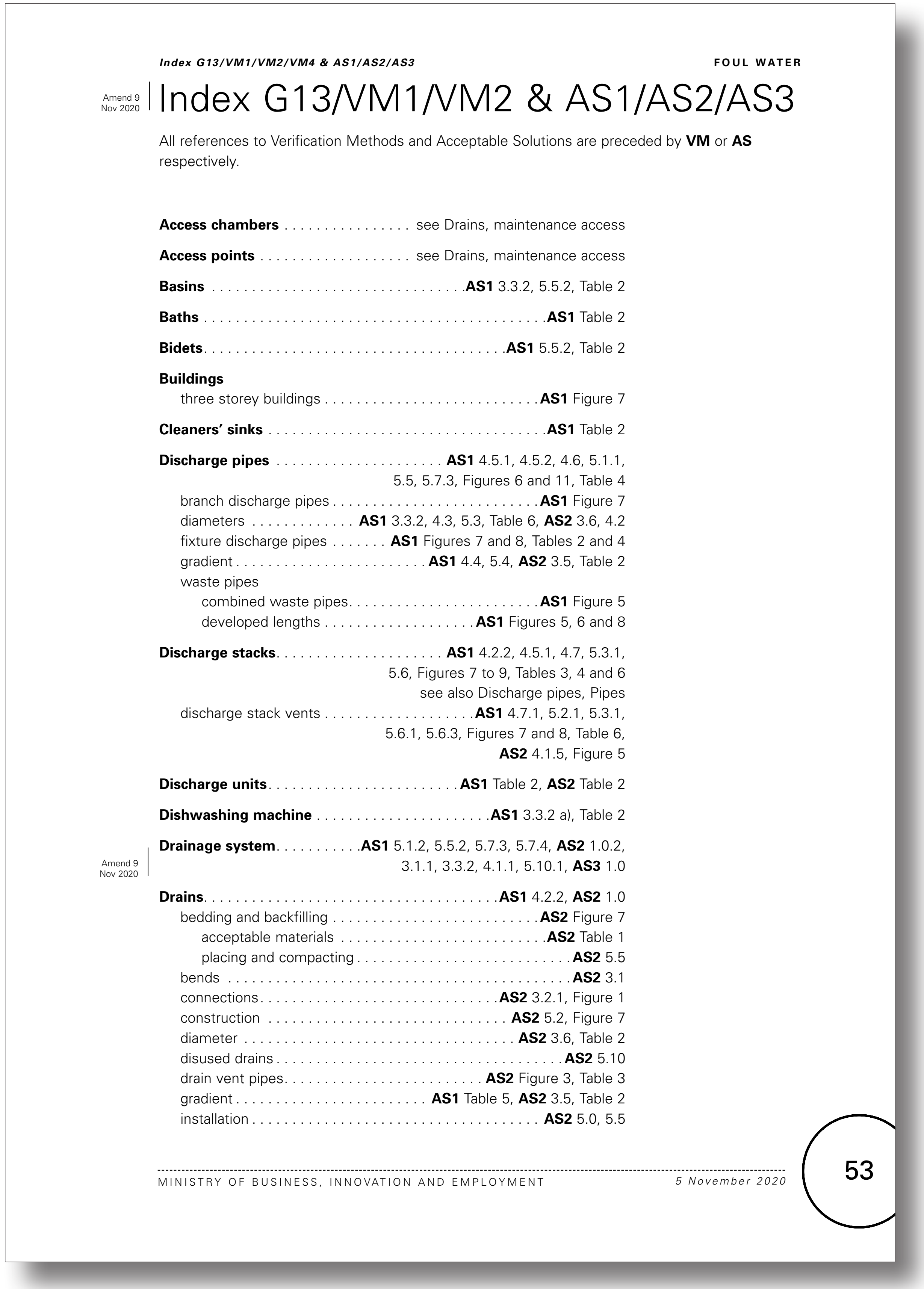
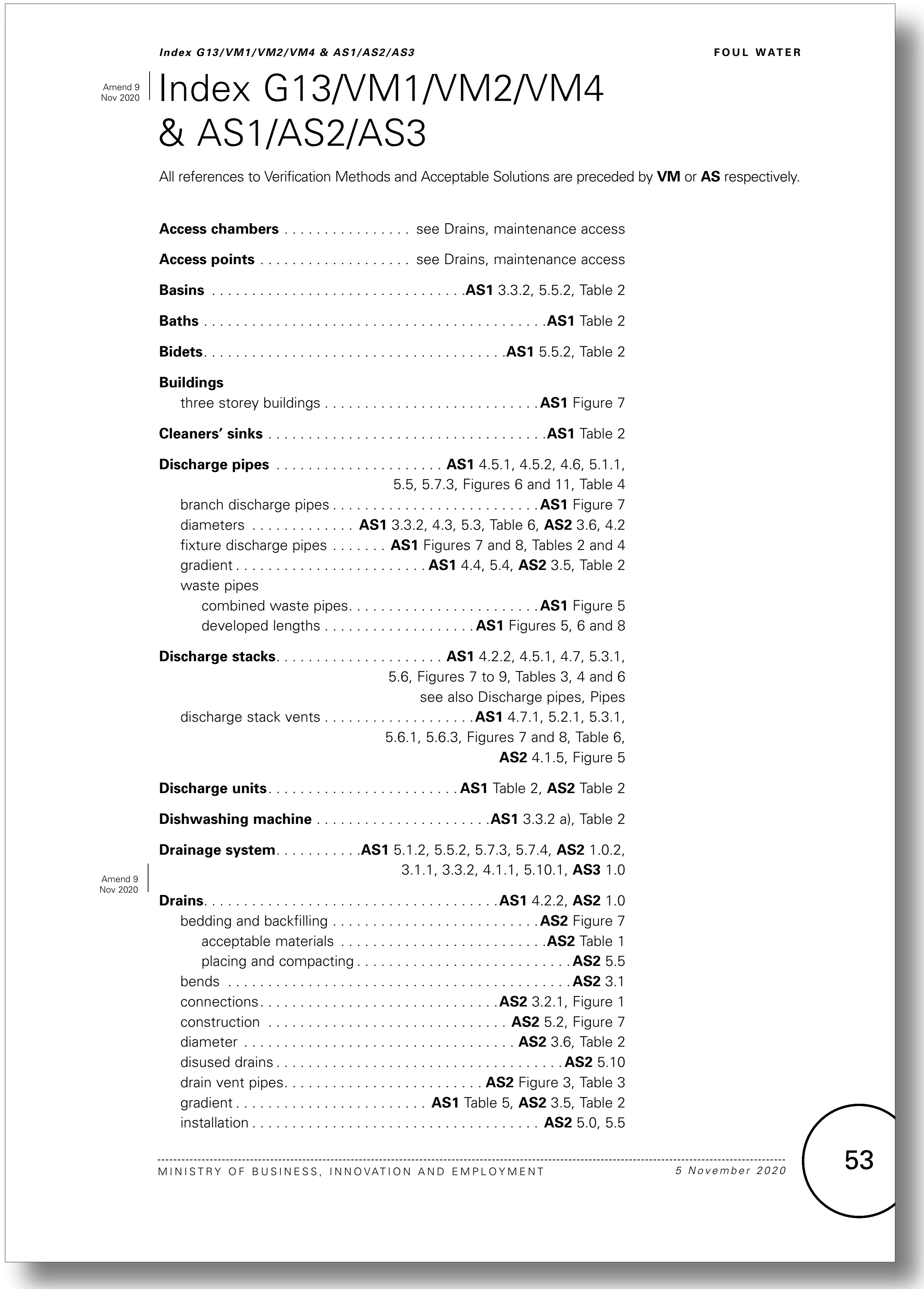


Amend 9
Nov 2020

Index G13/VM1/VM2 & AS1/AS2/AS3

All references to Verification Methods and Acceptable Solutions are preceded by **VM** or **AS** respectively.

Proposed G13 Foul Water - No changes proposed to this page



Amend 9
Nov 2020

Index G13/VM1/VM2/VM4 & AS1/AS2/AS3

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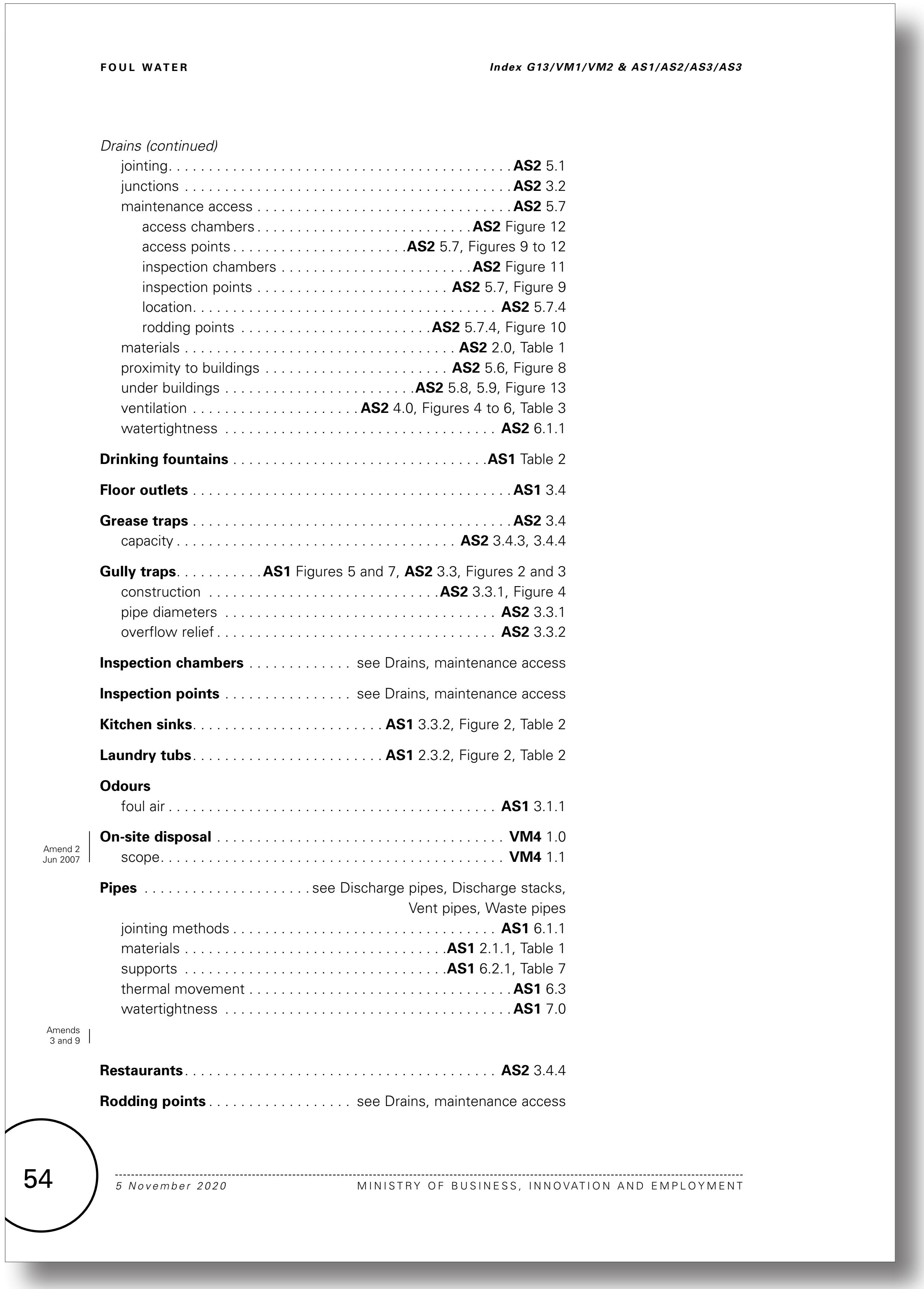
Current G13 Foul Water - No changes proposed to this page



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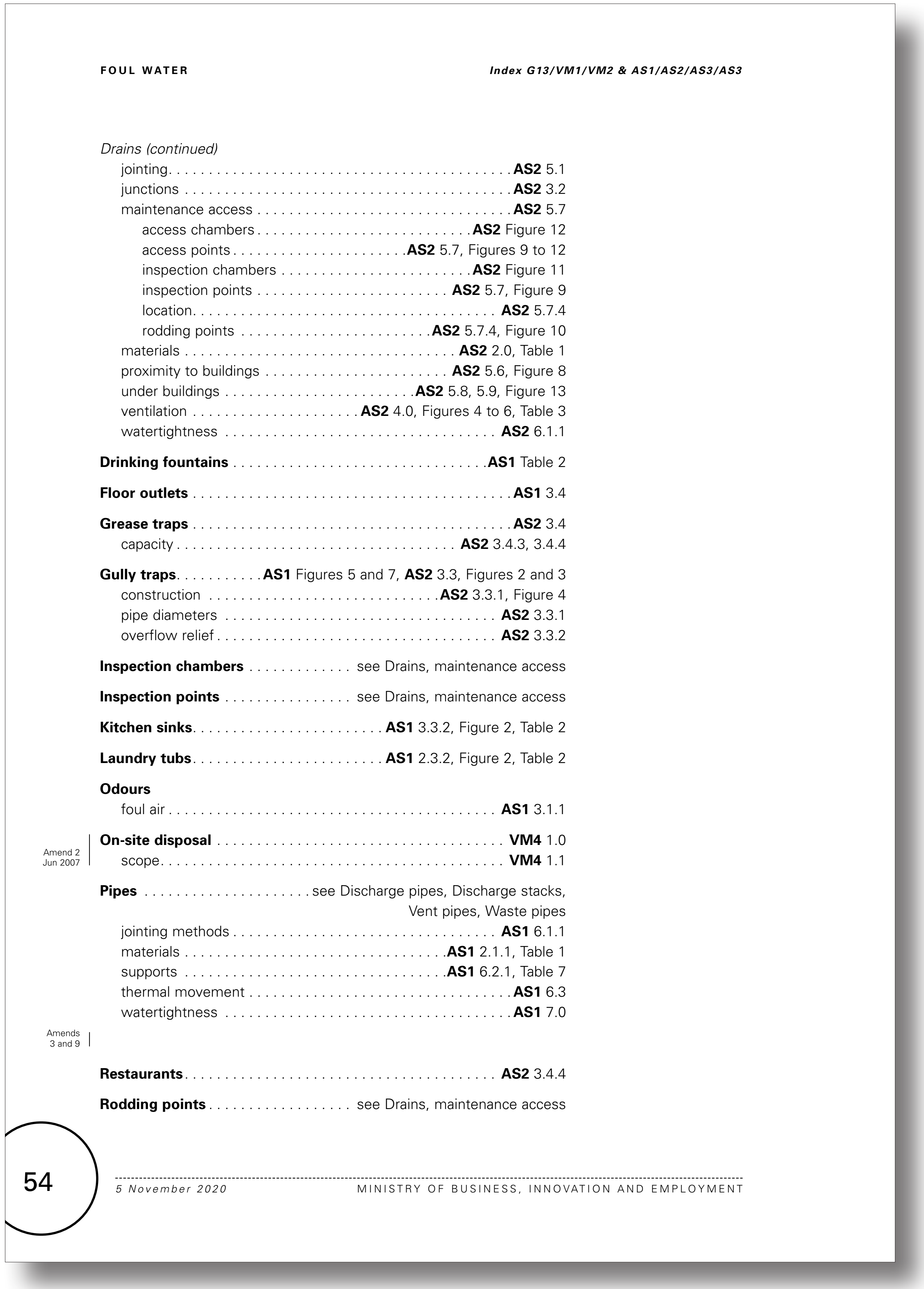

FOUL WATER *Index G13/VM1/VM2 & AS1/AS2/AS3/AS3*

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  junctions . . . **AS2** 3.2
  maintenance access . . . **AS2** 5.7
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    access points . . . **AS2** 5.7, Figures 9 to 12
    inspection chambers . . . **AS2** Figure 11
    inspection points . . . **AS2** 5.7, Figure 9
    location . . . **AS2** 5.7.4
    rodding points . . . **AS2** 5.7.4, Figure 10
  materials . . . **AS2** 2.0, Table 1
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  under buildings . . . **AS2** 5.8, 5.9, Figure 13
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Inspection points . . . see Drains, maintenance access

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  foul air . . . **AS1** 3.1.1

Amend 2 Jun 2007
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  scope . . . **VM4** 1.1

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  materials . . . **AS1** 2.1.1, Table 1
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Amends 3 and 9

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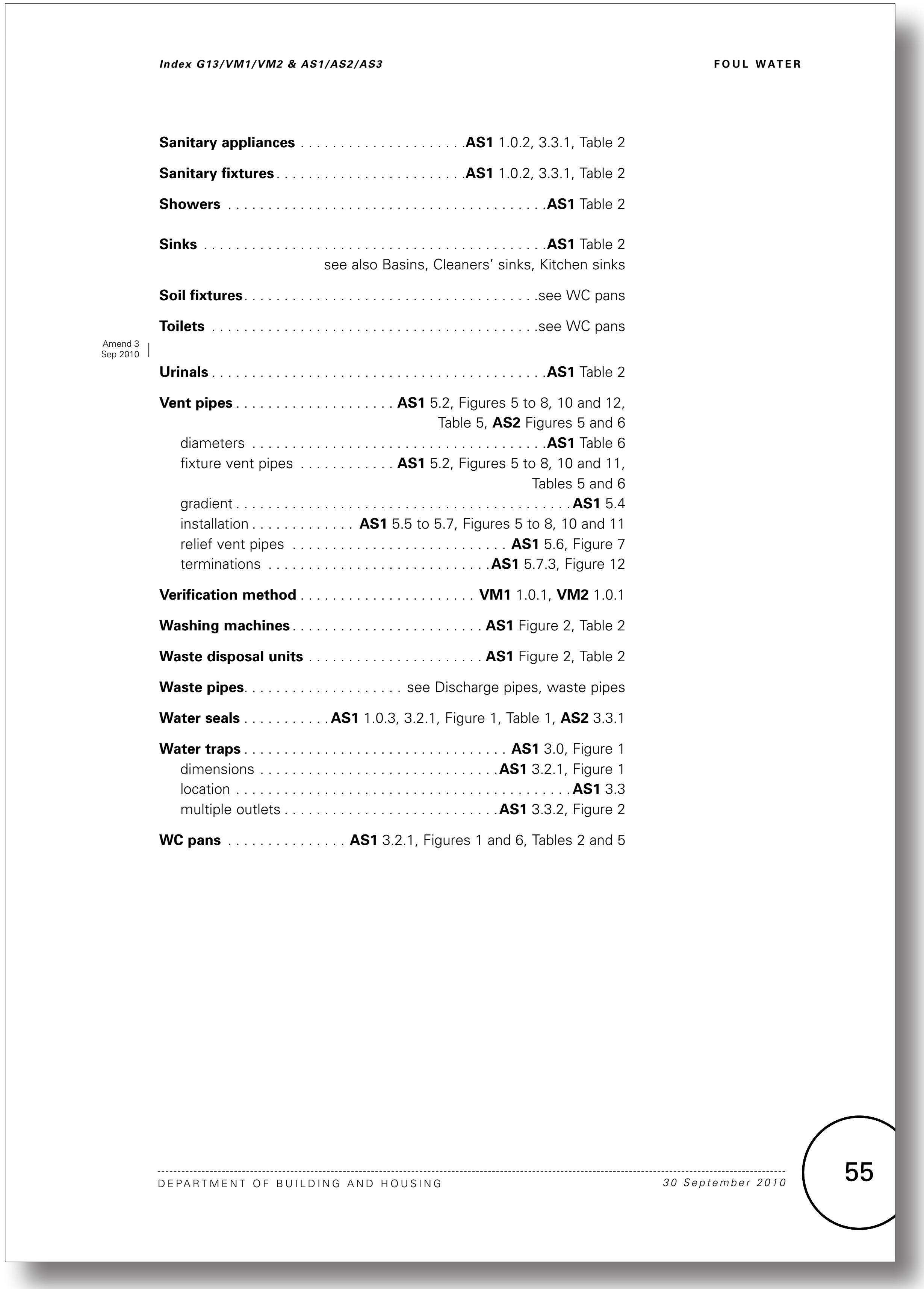
Current G13 Foul Water - No changes proposed to this page



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