

## Drainage DR 04 | Drainage in reactive soil

### Audience

The audience/s for this Practice Note include/s:

- |  |   |
|--|---|
| <input checked="" type="checkbox"/> Architects/ Designers          | <input checked="" type="checkbox"/> Owner Builders                  |
| <input checked="" type="checkbox"/> Builders                       | <input checked="" type="checkbox"/> Plumbers                        |
| <input checked="" type="checkbox"/> Building Surveyors/ Inspectors | <input type="checkbox"/> Real estate management agents              |
| <input checked="" type="checkbox"/> Engineers                      | <input type="checkbox"/> Trades and Maintenance (inc. Electricians) |
| <input type="checkbox"/> Home Owners / Residential Tenants         |   |

### Purpose

This Practice Note provides guidance on drainage installation in reactive soil, unstable and water charged ground to meet the requirements of AS/NZS 3500.2 – Clause 5.6.

The content below provides guidance on:

- Drainage installations and service life
- NCC 2022 Volume 3 Plumbing Code of Australia (PCA) Requirements
- Determining soil conditions
- Sites requiring special drainage designs
- Steps to follow when laying the drain
- Drainage Inspections



For guidance on the plumbing regulatory framework, refer to Plumbing Practice note RF 01 Regulatory Framework Plumbing NCC

## Abbreviations & Definitions

The abbreviations and definitions set out below are for guidance only. They are not intended to vary those set out in the Building Act 1993, Plumbing Regulations 2018, or the National Construction Code.

- **AS** – Australian Standard
- **ABCB** - Australia Building Codes Board
- **AS/NZS** – Australian/ New Zealand Standard
- **NCC** – National Construction Code
- **PCA** – Plumbing Code of Australia



## Drainage installations and service life

Damage to sanitary drains can occur if the methods of bedding and drain support are not designed to suit the ground conditions, such as in filled, unstable or water-charged ground.

Failure of drains can result in expensive property damage, environmental damage, illness and temporary or permanent loss of amenity.

Prior to the commencement of drainage work, the site classification should be obtained. Sites classification is based on the expected level of ground movement and will assist in determining when additional protection may be required for a sanitary drainage installation.

### Reactive soil, unstable and water-charged ground

- Reactive soils are prone to expansion and contraction due to moisture levels within the ground. Certain soil types can contract in dry conditions and expand in wet conditions which will affect buildings and their drains. Guidance on site classification based on soil reactivity can be obtained from Section 2, of AS 2870.
- Unstable ground is a ground condition that is lacking stability, fixity, or firmness because of the nature or influence of other related conditions it cannot be depended upon to remain in place without extra support. An example of this condition is filled ground that has not been compacted.
- Water charged ground is ground that is subject to a high-water table level also known as saturated ground.

## NCC 2022 Volume 3 Plumbing Code of Australia (PCA) Requirements

### Sanitary drainage objectives

Part C2 Sanitary drainage systems of PCA 2022 sets out objectives to safeguard people from illness, injury, or loss (including loss of amenity), due to the failure of a sanitary drainage installation, and ensure that a drainage installation continues to satisfy these and other objectives throughout its serviceable life.

### Performance requirements

To meet these objectives, this part sets out Performance Requirements for a range of aspects that all drainage installations must meet. This includes requirements that a sanitary drainage installation must avoid damage from root penetration, superimposed loads or ground movement.

### Deemed to satisfy provisions

The Deemed-to-Satisfy Provisions for sanitary drainage systems in the PCA requires compliance to AS/NZS 3500.2.

Clause 5.6 of this standard requires “*where drains are to be laid in filled, unstable or water charged ground, methods of support and bedding must be designed to withstand and suit the ground conditions*”. It also includes guidance on the installation of plastic drainage pipe systems in unstable soils for class 1 buildings (see Appendix G of the Standard) and reference to AS 2870 for information on how soil conditions are classified and special design considerations for drainage in residential slab or footing systems in reactive soils.



## Determining soil conditions

Before a drainage system can be designed appropriate to the soil conditions, identification of the soil conditions must first occur. Soil type classifications can be used as an indicator of the soil conditions and expected possible movement on the site. The classification indicates how reactive the soil is and is normally indicated on the site plans or in a soil report from a geotechnical engineer. Plumbers must be aware of the site soil conditions and ensure that the design of the drainage system will protect the drain from the amount of potential movement.

## Sites requiring special drainage designs

Where a site is classified M, H1, H2, or E the site will require protection from ground movement.

Class P sites are problem sites and also require protection from movement, however, the classification alone does not provide enough information for a design to be prepared due to the factors that contribute to the P classification. Such factors may include filled uncompacted ground or potential to collapse and more advice should be sought as to the nature of the contributing factors.



It is recommended that any design proposed is checked by a suitably qualified engineer (e.g. hydraulic) to ensure that it is appropriate for the site conditions.

## Steps to follow when laying the drain

1. Determine the soil conditions from the soil report or the approved plan. This information can generally be obtained through the builder.
2. Based on the soil classification, ensure that the drain is designed to suit the ground conditions taking into consideration for any possible ground movement or other contributing factors. Table 1 below provides examples of acceptable design documentation.
3. Lay the drain as per the design and offer the drain for inspection.

## Drainage Inspections

Under the Building Act 1993, plumbers who perform or supervise below ground sanitary drainage work have an obligation to offer the drain to the VBA for inspection. More information on [drainage inspections](#) may be obtained from the VBA website.

During an inspection, a plumber may be asked for documentation of the soil classification and evidence of suitability for the design. Table 1 provides examples of appropriate documentary evidence.



EXAMPLES OF ACCEPTABLE DOCUMENTATION	TYPE OF EVIDENCE REQUIRED		
	A or S class sites	M, H1, H2, or E class sites	P class site
<b>EVIDENCE OF SITE SOIL CLASSIFICATION</b>			
Site specific soil report from a geotechnical engineer	YES	YES	YES
Approved plans (by the Relevant Building Surveyor) for construction which specify the soil classification	Not required	YES	YES
<b>EVIDENCE THAT THE DRAIN HAS BEEN DESIGNED TO SUIT THE GROUND CONDITIONS</b>			
Drainage design in accordance with AS/NZS 3500.2:2021, Appendix G and/or AS 2870—2011	Not required	YES	NO
A site specific engineering schedule or drainage design which has been approved for construction by the Relevant Building Surveyor.	Not required	YES	YES
A drainage design or document from a recognised expert which describes in adequate detail the drain installation and how it will address the risks caused by any possible movement.	Not required	YES	YES*
A site specific drainage design by a qualified engineer.	Not required	YES	YES
<p>* <b>NOTE:</b> A recognised expert must have appropriate knowledge and experience to design a drain to suit the ground conditions.                      A recognised expert may be a licenced plumber for A, S, M, H1, H2, and E sites.                      Where a plumber nominates themselves as a recognised expert for the design of a drain on a P class site, the design should be checked by an appropriately qualified engineer.</p>			

**Table 1 – Examples of acceptable documentation to meet AS/NZS 3500.2 - Clause 5.6 requirements.**

For more information on [drainage inspections](#) refer to the VBA website.

**Related Documentation**

- National Construction Code 2022 Volume 2 & 3
- AS/NZS 3500.2:2021 Sanitary plumbing and drainage
- AS 2870 Residential slabs and footings
- <https://www.vba.vic.gov.au/plumbing/renewals-other-requirements/drain-inspection-bookings>

**List of Amendments**

- Updated to reflect the NCC 2022 requirements and AS/NZS 3500:2:2021 additions.
- Content simplified to improve readability
- Table 1 added for quick reference and to provide examples of acceptable documentation



## Document history

<b>Sector</b>	Plumbing
<b>Category</b>	Drainage
<b>Topic</b>	Drainage in reactive soil
<b>Document number</b>	03
<b>Version</b>	1.0
<b>Superseded</b>	<ul style="list-style-type: none"><li>Supersedes Technical Solution Sheet 3.06 Drains in Reactive Soils, Unstable or Water Charged Ground.</li></ul>
<b>Published</b>	24 July 2023

## Contact Us

If you have a technical enquiry, please email [plumbingtechnicaladvice@vba.vic.gov.au](mailto:plumbingtechnicaladvice@vba.vic.gov.au) or call 1300 815 127.

### **Victorian Building Authority**

Goods Shed North  
733 Bourke Street  
Docklands VIC 3008

[www.vba.vic.gov.au](http://www.vba.vic.gov.au)

## Copyright

© July 2023 Victorian Building Authority (VBA).

This Practice Note has been prepared and published by the VBA for general educational and information purposes only. This publication must not be copied, reproduced, published, adapted, or communicated by any person without the VBA's prior written consent or as permitted by the Copyright Act 1968 (Cth). The VBA makes no warranties or representations whatsoever about the accuracy, reliability, suitability, completeness or authenticity of any information or material contained in this resource. Any use or reliance on such information is at a person's own risk. The VBA accepts no liability whatsoever for any direct, indirect, or consequential loss or damage any person may suffer arising out of or in connection with the access or use of this resource (including any third-party material included in this resource).