

Drains in Reactive Soil, Unstable and Water Charged Ground

AIM

The aim of this technical solution is to provide information to practitioners for overcoming problems associated with drain damage resulting from movement in reactive soils, unstable and water charged ground.

PLUMBING REGULATIONS 2008

The *Plumbing Code of Australia* (PCA) is adopted by and forms part of the *Plumbing Regulations 2008*. Part C2 of the PCA specifies the objectives and performance requirements related to the installation of sanitary drainage systems. *AS/NZS 3500.2: Plumbing and drainage Part 2: Sanitary plumbing and drainage* and *AS/NZS 3500.5 Plumbing and drainage Part 5: Housing Installation* are “Deemed-to-Satisfy” documents listed in Part C2 of the PCA and contain provisions on drains in unstable ground.

BACKGROUND

Reactive soils are soil types that are prone to expansion and contraction due to the variation in moisture content.

Possibly due to prolonged and severe droughts, drains that were never previously affected have been damaged by the effect of reactive soils.

AS/NZS 3500.2 Clause 5.6 - Drains in other than stable ground - requires practitioners to be aware of the site specific soil conditions they are working in as the soil conditions may affect the performance of any plumbing or drainage installation. The method used by practitioners to protect the drainage installation will then need to be designed to withstand and suit the ground conditions. Drains that are laid below ground in reactive soils must be designed and constructed with provision to protect the drain for the expected range of ground movement.

WHAT IS REACTIVE SOIL, UNSTABLE AND WATER CHARGED GROUND?

The following definitions can be used to determine reactive soil, unstable ground and water charged ground:

- **Reactive soils** are soil types that swell on wetting and shrink on drying creating differential movement.
- **Unstable ground** is a ground condition that, because of the nature or the influence of other related conditions, cannot be depended upon to remain in place without extra support.
- **Water charged ground** is ground that is subject to a high water table condition.

HOW DO I KNOW IF I AM WORKING IN REACTIVE SOIL, UNSTABLE AND WATER CHARGED GROUND?

Soil type classifications can be used as an indicator of the soil conditions and expected level of site ground movement. A soil classification report will provide the site classification based on soil type, reactivity and the expected ground movement. It is the responsibility of the licensed plumber to be aware of the soil conditions prior to commencing drainage work (See Table 1).

WHICH OF THESE SITE CLASSIFICATIONS WILL REQUIRE SPECIAL DRAINAGE INSTALLATION DESIGN?

Where a soil classification report gives a rating of M, H1, H2, E and P, the site will require special provisions for drainage installations.

Technical Solution Sheet 3.06

TABLE 1 – TYPICAL SOIL CLASSIFICATION BY CHARACTERISTIC SURFACE MOVEMENT

SOIL CLASSIFICATION	SOIL FOUNDATION	CHARACTERISTIC SURFACE MOVEMENT (ys) mm
A	Most sand and rock sites with little or no ground movement from moisture changes	ZERO
S	Slightly reactive clay sites, which may experience only slight ground movement from moisture changes	0 - 20mm
M	Moderately reactive clay sites, which may experience moderate ground movement from moisture changes	21 - 40mm
H1	Highly reactive clay sites, which may experience high ground movement from moisture changes	41 - 60mm
H2	Highly reactive clay sites, which may experience very high ground movement from moisture changes	61 - 75mm
E	Extremely reactive sites, which may experience extreme ground movement from moisture changes	75 mm+
P	Applies to "problem" sites (e.g. filled soil or potential to collapse). Special provisions apply.	AS TESTED

NOTE: Only **one** soil classification is necessary. If the practitioner is provided with an existing soil classification carried out by a suitably qualified person on behalf of the owner, builder, architect or engineer this will satisfy the requirement.

WHAT STEPS ARE REQUIRED TO BE TAKEN TO ENSURE THE BELOW GROUND SANITARY DRAIN INSTALLATION IS COMPLIANT?

Before you commence any below ground drainage work, ensure you do the following:

1. Determine the soil conditions. The most reliable method is by obtaining a soil classification report based on the requirements specified in the Australian Standard *AS 2870 Residential slabs and footings*. This will generally be provided by the Builder – but if not you should determine

the soil conditions prior to work commencing.

2. Design the below ground sanitary drain considering the onsite soil conditions and classification.

The design may be by means of one of the following methods –

- a. A document describing in adequate detail the drain installation and how it will address any potential risks raised by the soil classification; or

Technical Solution Sheet 3.06

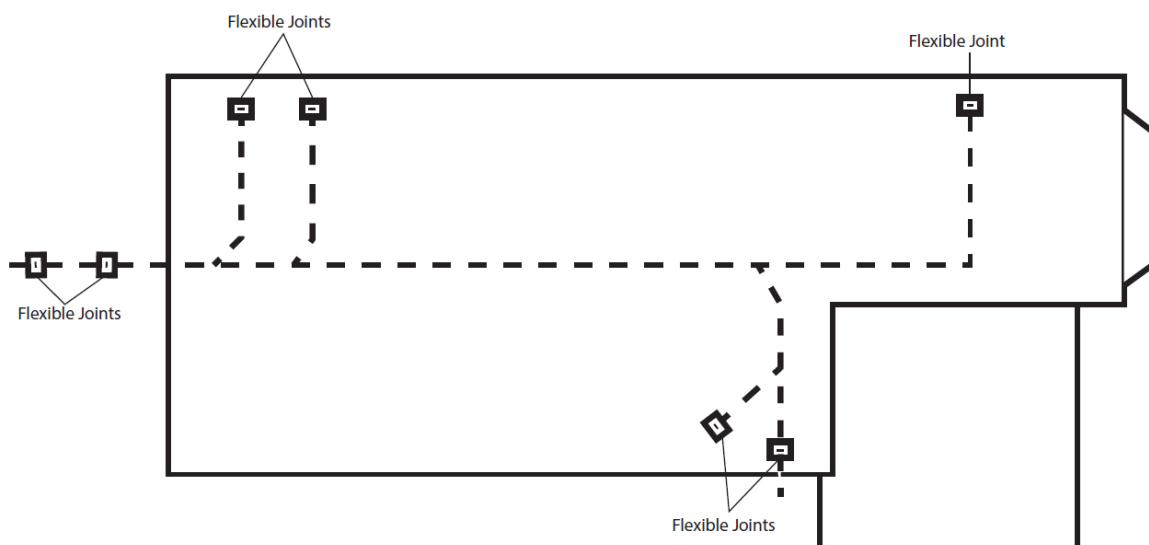
- b. A drain design plan indicating detail of the requirements for the drain installation relevant to the soil classification – for example see Figure 1; or
 - c. Other documentation provided to the practitioner detailing the requirements for the drain installation relevant to the soil classification (e.g. technical drawings).
3. Lay the drain as per the design and offer the drain for a below ground drain inspection.
 4. During an inspection, a plumber will be asked how they determined the soil conditions and to provide evidence for their determination. The most effective method of demonstrating compliance will be to

provide the plumbing inspector with a soil classification report.

5. Practitioners are required to keep an accurate record of the soil conditions onsite and their drain design, either electronically or hard copy.

The VBA strongly advises practitioners to carefully assess any drainage design provided to them. In the event of an installation failure due to an incorrect soil determination or design, the practitioner will be held responsible for the entire plumbing installation.

FIGURE 1: EXAMPLE OF DRAINAGE DESIGN



NOTE: The above is only an example of a drainage design and not to be used as a below ground solution for a sanitary drain in unstable ground. Practitioners should ensure their drainage design plan is relevant to the site.

The VBA strongly advises practitioners to refer to the complete Standard to ensure they comply with all Deemed-to-Satisfy requirements.

The full text of AS/NZS 3500.2:2015 and AS/NZS 3500.5:2012 can be found at the SAI Global website:

<http://www.saiglobal.com/>