

# Association of Hydraulic Services Consultants Australia - Queensland Chapter

## *Plumbing Requirements Vs Soil Conditions*

TIM RYAN - 16/04/24



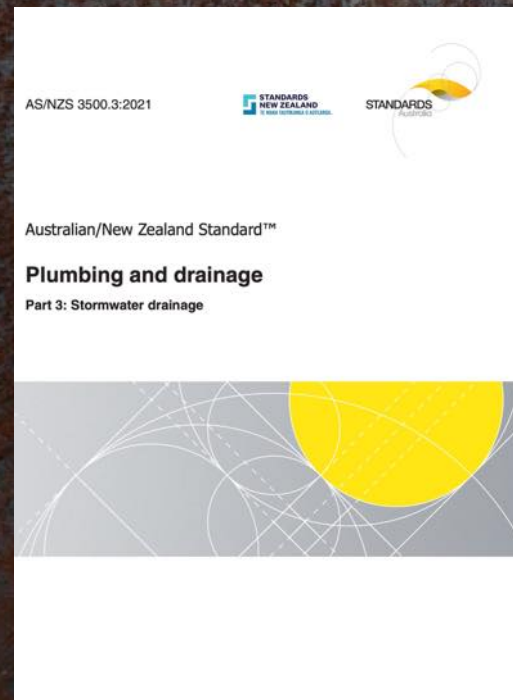
**AW**GEOTECHNICS

# What are we covering

- The key Australian Standards
  - AS3500
  - AS2870
- QLD Policy
- NSW & VIC Approach
- FAQs & Examples
- Suggestions

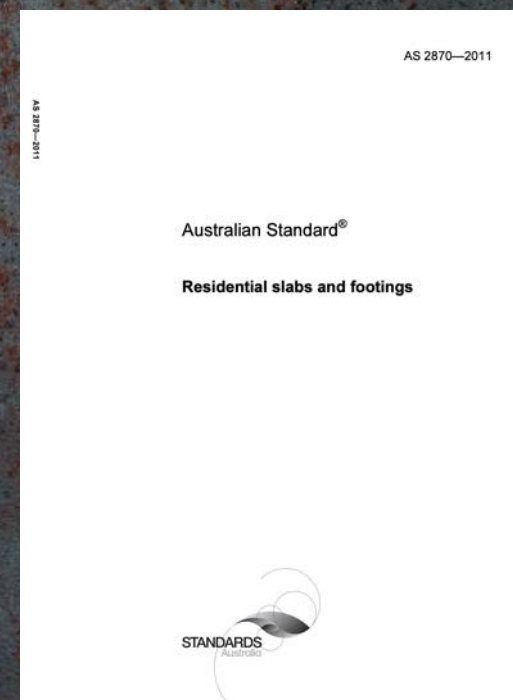
# AS3500.2 & 3 : 2021 - Plumbing & Drainage

- AS3500.2 – Sanitary Plumbing and Drainage
- AS3500.3 – Stormwater Drainage



# AS2870 : 2011 - Residential slabs & footings

- Soil Testing
- Site Classifications
- Slab Designs
- Details & Construction Requirements



# AS3500.2 Preface

**The major changes in this revision are as follows:**

(vii) An appendix has been added providing guidance on the requirements of AS 2870 for flexible connections to be installed in plastics pipe drainage systems. It covers flexible connections, lagging and water ingress under the slab to accommodate a range of differential soil movement for Soil Classes M, M-D, H1, H1-D, H2, H2-D, E and E-D.

# AS3500.2 Clause 5.6

## **Drains in other than stable ground**

Where drains are to be laid in filled, unstable or water-charged ground, methods of support and bedding shall be designed to withstand and suit the ground conditions.

NOTE 1 See Appendix G for information on the installation of plastics pipe drainage systems in unstable soils. systems on moderately, highly or extremely reactive soils.

NOTE 2 AS2870 provides special design considerations for drains associated with residential slab or footing systems on moderately, highly or extremely reactive soils.

NOTE 3 Clause 3.8.2 provides special design considerations for drains in close proximity to footings.

NOTE 4 For proclaimed mine subsidence or landslip districts, the appropriate authority should be referred to for advice on subsidence or landslip design parameters for proposed drainage systems.

NOTE 5 In Australia, acceptable evidence that a design may be deemed suitable is provided for in the Plumbing Code of Australia.

NOTE 6 In New Zealand, drains in other than stable ground should be specifically designed.

NOTE 7 In New Zealand, refer to NZS 4404 for information on the design of wastewater pipes in seismically active areas.

This clause included new Notes 1 & 6.

# AS3500.2 Appendix G

## G.1 Scope

- Class 1 only.
- Guidance for Class M to E-D only.
- No specific design for Class P

G.2 Site Classification based upon soil reactivity as per AS2970-2011

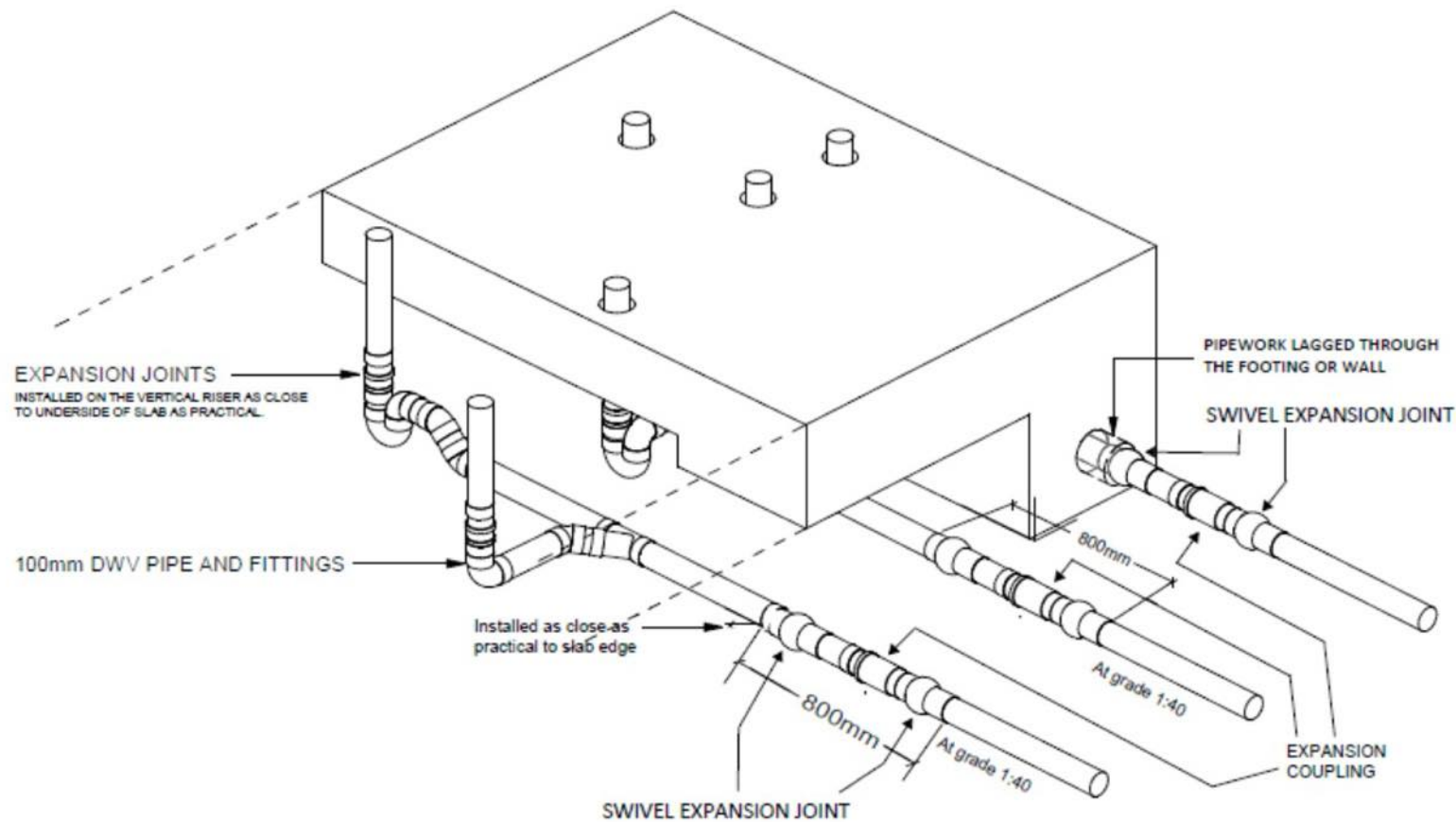
G.3 Drainage for buildings on site with predicted differential ground movement

G.4 Differential movement inspection chambers or similar structures

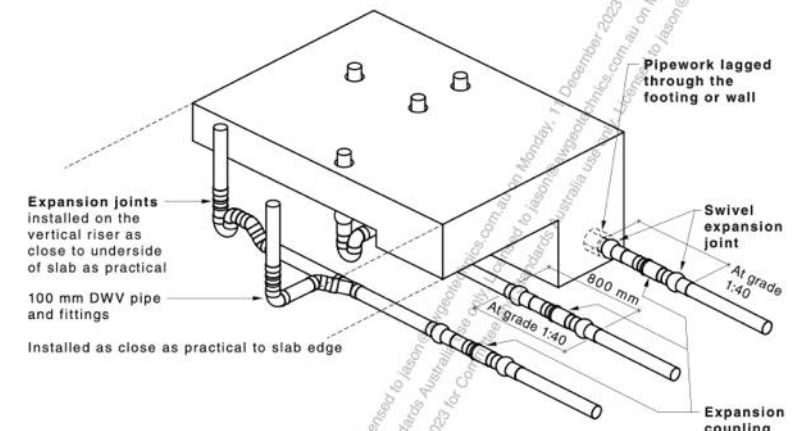
G.5 Vertical Risers

G.6 Graded Risers

Downstream of joints



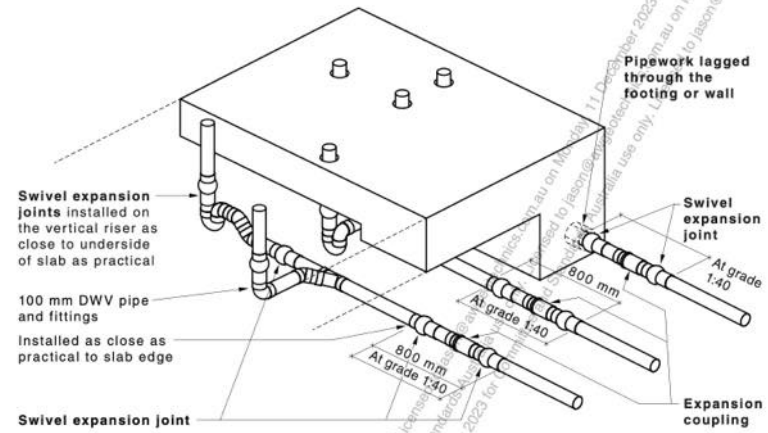
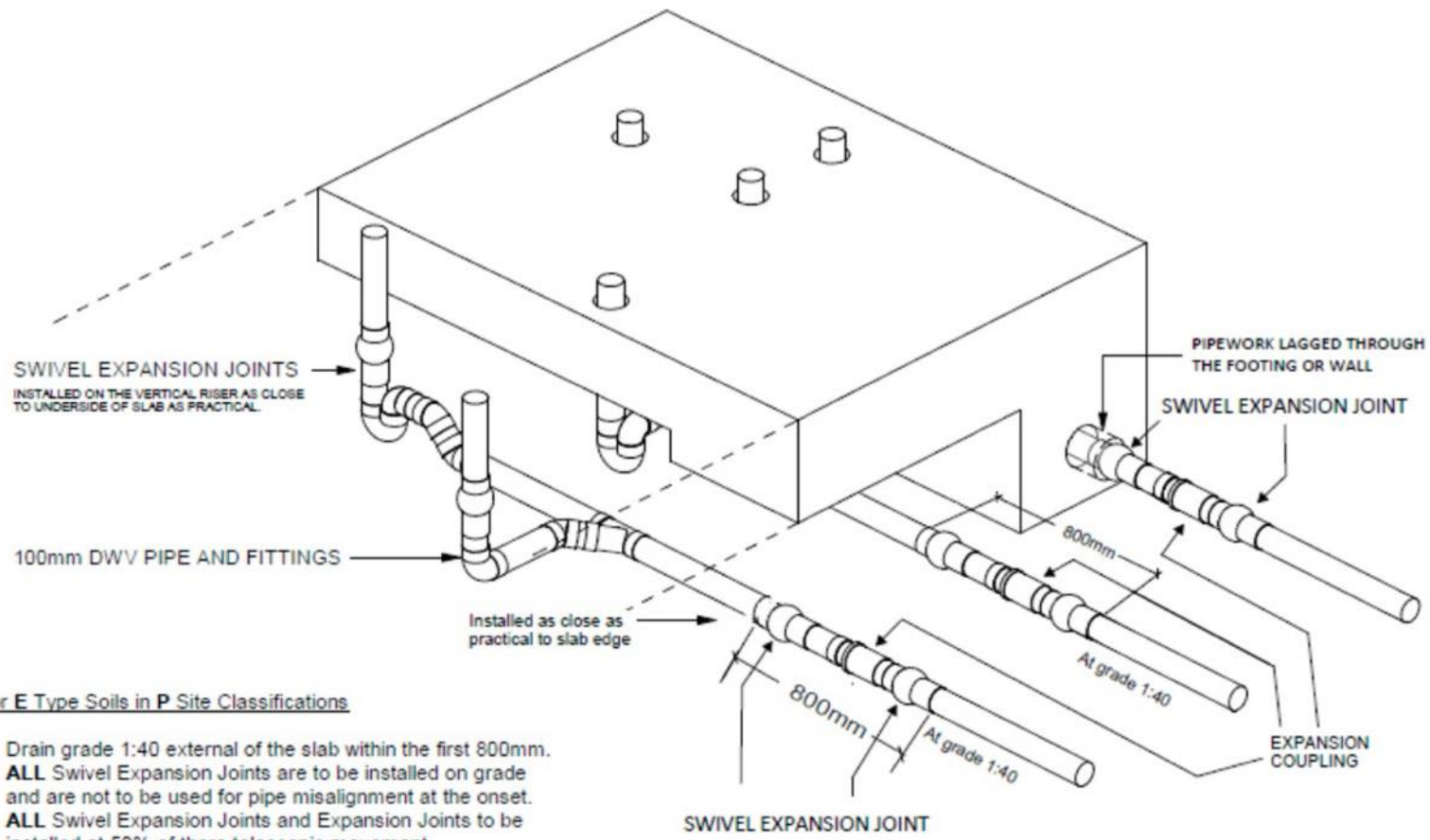
**TYPICAL SITE CLASSIFICATION DESIGN for TYPE H ARTICULATION  
(informative)**



[SOURCE: ©Moreton Bay Council 2020. Reproduced with permission from Moreton Bay Regional Council, Queensland.]

- NOTE 1 Drain grade should be 1:40 for the first 800 mm external to the slab.
- NOTE 2 Swivel expansion joints installed on grade should not be used to correct pipe misalignment.
- NOTE 3 Swivel expansion joints and expansion joints should be installed at 50 % of their telescopic movement.
- NOTE 4 Expansion joints installed on vertical risers should have a minimum of 40 mm telescopic movement.

**Figure G.5(A) — Potential locations of below-ground swivel and expansion joints for sites classified as H**



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- NOTE 1 Drain grade should be 1:40 for the first 800 mm external to the slab.
- NOTE 2 Swivel expansion joints installed on grade should not be used to correct pipe misalignment.
- NOTE 3 Swivel expansion joints and expansion joints should be installed at 50% of their telescopic movement.
- NOTE 4 Swivel expansion joints installed on vertical risers should have a minimum of 75 mm telescopic movement.

Figure G.5(B) — Potential locations of below-ground swivel and expansion joints for sites classified as E

For E Type Soils in P Site Classifications

- Drain grade 1:40 external of the slab within the first 800mm.
- **ALL** Swivel Expansion Joints are to be installed on grade and are not to be used for pipe misalignment at the onset.
- **ALL** Swivel Expansion Joints and Expansion Joints to be installed at 50% of their telescopic movement.
- **ALL** Swivel Expansion Joints and Expansion Joints to have a **Minimum** of 75mm Telescopic Movement in E type soils.

**TYPICAL SITE CLASSIFICATION DESIGN for TYPE E ARTICULATION  
(informative)**

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## AS3500.3 Appendix M.11

### **M.11 Other than stable grounds**

Where excessive soil movement due to filled, unstable, or water charged ground may affect the performance of any site stormwater drain or subsoil drain, than such drain should be installed in accordance with the plans and specifications based on a geotechnical report and calculations.

In proclaimed mine subsidence districts, site stormwater drains larger than DN225 should confirm to the requirements of the relevant authority.

# AS2870-2011 Residential slabs and footings

- Section 1 - Scope & General
  - Limit of code & where it should be applied
- Section 2 - Site Classification
  - How to determine if A, S, M, H1, H2, E & P Class
- Section 3 - Standard Designs
  - Deem to comply designs for A to H2 sites
- Section 4 - Design by Engineering Principles
  - How to apply engineering to alter standard designs
- Section 5 - Detailing Requirements
  - Drainage & special requirements for aggressive soils
- Section 6 - Construction Requirements
  - Excavation, fill, allowable bearing & sloping sites
- Appendices & Commentary

# AS2870-2011 Residential slabs and footings

What buildings are not covered;

- Building longer than 30 m and higher than 8.5 m.
- Slabs with permanent control joints.
- Suspended concrete construction with openings greater than 2.5m, spans greater than 5 m and thicknesses greater than 175 mm.
- 32 MPa or greater concrete.
- 3 storeys or more.

Clause 1.2 c) all designs to comply with Sections 5 & 6.

Residential footing system design, details and construction shall also comply with AS3600 except that, when in conflict, this standard (AS2870) shall take precedence.

# AS2870-2011 Residential slabs and footings

What is not covered;

- Deem to comply design solutions for some H2 construction methods and any E class sites.
- P Site Classifications deem to comply design solutions or any general design recommendations.
- How to design for trees.
- How to install plumbing articulation.

# Site Classification

## 2.1.1 Classification

Site classification is based on the expected ground surface movement and the depth to which this movement extends. Sites shall be classified in accordance with Clauses 2.1.2 and 2.1.3.....

2.1.2 Site Classification based on soil reactivity

2.1.3 Classification of other sites



# Site Classification

## 2.1.2 Site Classification based upon soil reactivity

“Classification of sites where ground movement is predominantly due to soil reactivity under normal moisture conditions shall be classified based upon the expected level of ground movement...”

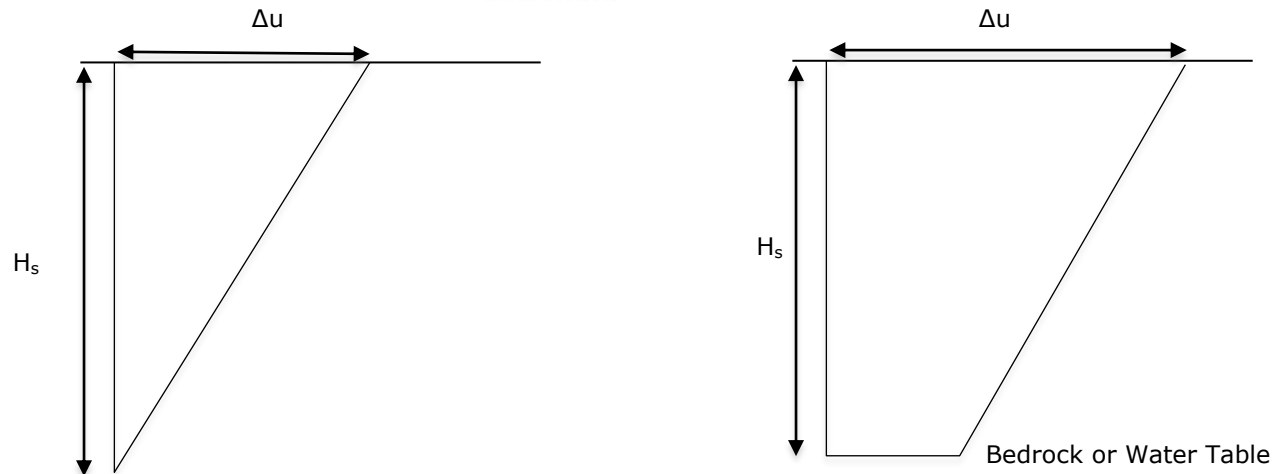
Site Classification	Characteristic Surface Movement (ys) mm	Foundation
A	Nil	Rock and Sand. Nil Movement
S	< 20	Slightly Reactive & Movement
M	21 < ys < 40	Moderately Reactive & Movement
H1	41 < ys < 60	Highly Reactive & High Movement
H2	61 < ys < 75	Highly Reactive & Very High Movement
E	75 +	Extreme Reactive & Movement

# Site Classification

## 2.3.1 Characteristic Surface Movement

For site classification purposes, the characteristic surface movement ( $y_s$ ) shall be determined by estimating the movement of each soil layer 1 to N within the depth of design suction change and summing the movement for all layers, as follows:

$$y_s = \frac{1}{100} \sum_{n=1}^N (I_{pc} \overline{\Delta u h})_n$$



# Site Classification

## 2.3.1 Characteristic Surface Movement

The instability index is not a constant for a particular clay, but it may be estimated from the soil shrinkage index (Ips). The soil shrinkage index shall be derived using one or more of the following methods:

- 1.(i) Laboratory tests for soil reactivity, as set out in AS1289.7.1.1, AS1289.7.1.2 & AS1289.7.1.3.
- 2.(ii) Correlations between shrinkage index (Ips) and other clay index tests for the soil type.
- 3.(iii) Visual-tactile identification of the soil by a suitably qualified and experienced person.

4.NOTE: A suitably qualified and experienced person is an engineer or engineering geologist having appropriate expertise and local experience. For method (iii) above, the suitably qualified and experienced person shall check the soil property identification against laboratory testing on reactive soils at a period not longer than 6 months and at least once in every 50 sites personally classified.



# Site Classification

Ips determination from U50 tube sample to obtain a shrink & swell sample

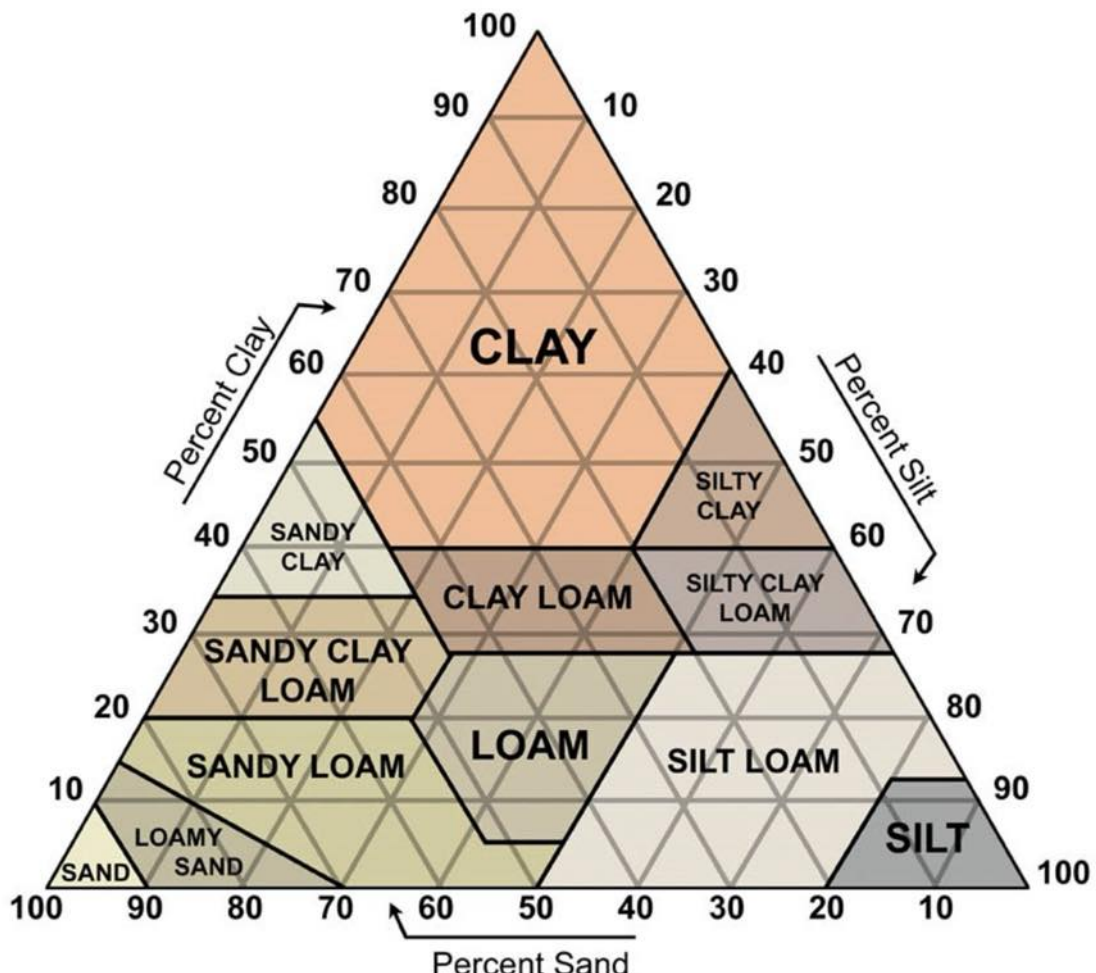


**GEO-CON**  
PRODUCTS PTY LTD  
Testing Equipment for the Construction Industry



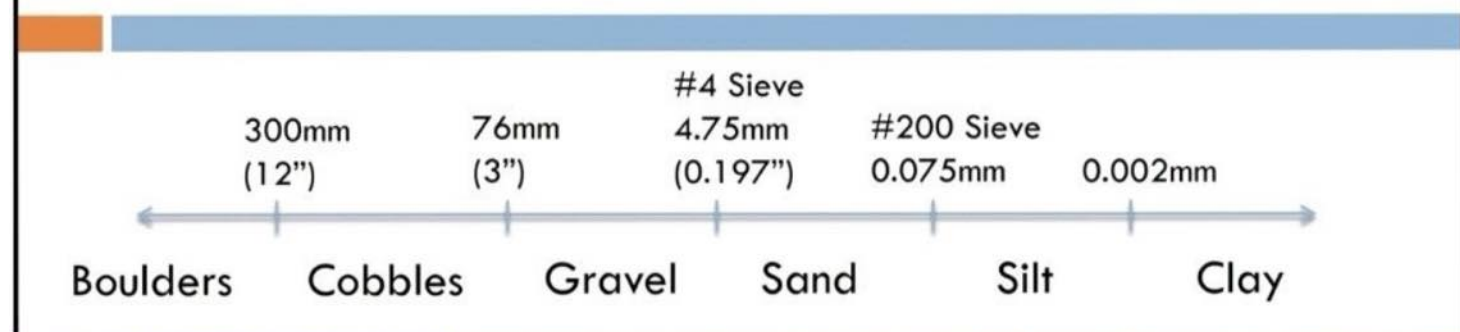
Reference Dry Weather Mean Dry Soil & Foundation Settlement by McNee 2016

# Site Classification



## Soil Particle Size

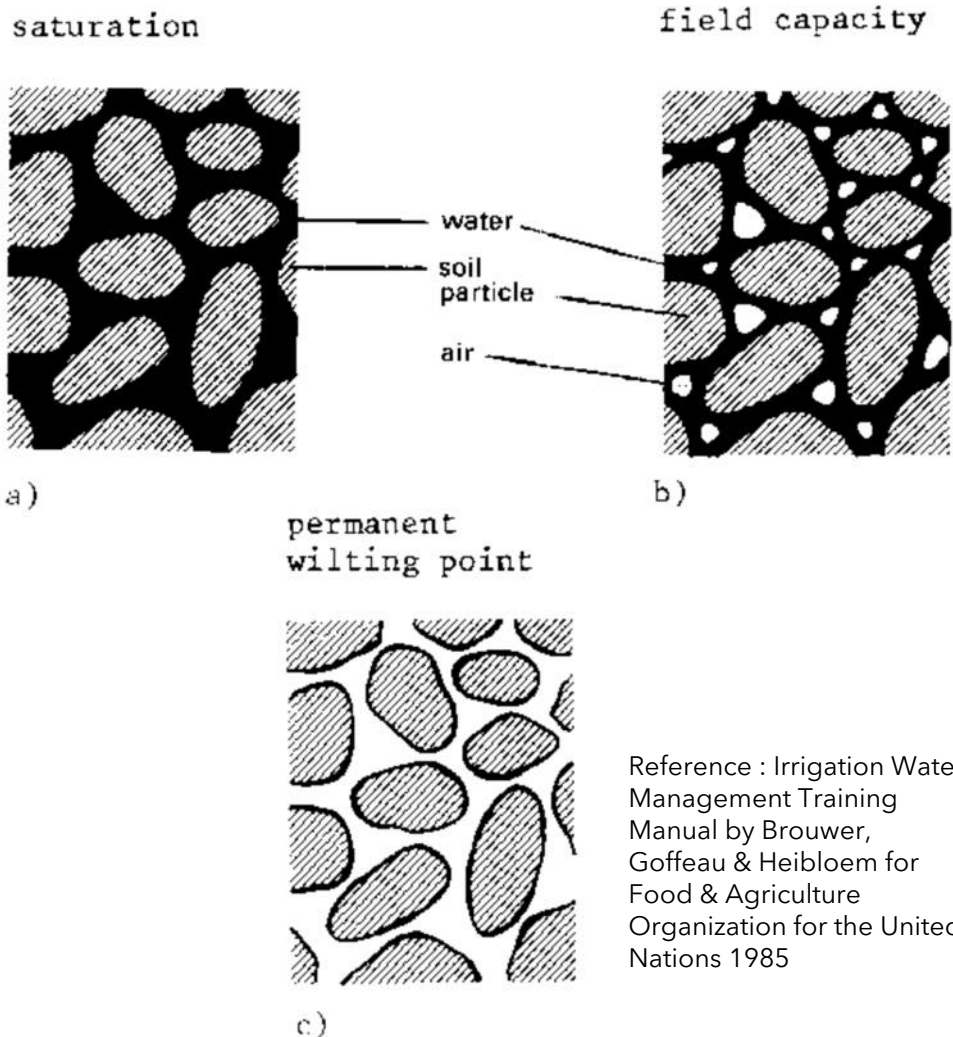
Reference Ahmed Khatab / Fugro



# Site Classification

If pure sand is one end of the spectrum, Bentonite Clay would be at the other end.

Can absorb large amounts of water resulting it's volume being able to increase by a factor 8



Reference : Irrigation Water Management Training Manual by Brouwer, Goffeau & Heibloem for Food & Agriculture Organization for the United Nations 1985



# Site Classification

## 2.1.3 Classification of other sites

“Sites with inadequate bearing strength or where ground movements may be significantly affected by other than reactive soil movements due to normal moisture conditions shall be classified as Class P”

A site shall be classified as Class P if

- The allowable bearing capacity  $< 50\text{kPa}$  for slabs.
- The allowable bearing capacity  $< 100\text{ kPa}$  for isolated footings.
- Excessive foundation settlement is expected.
- The site has uncontrolled fill present.
- The site is subject to mine subsidence, landslip, collapse activity or coastal erosion.
- The site is subject to abnormal moisture conditions.
- The site may be subject to other factors beyond reactive soil movements

# Abnormal Moisture Conditions

## Prior to Construction (site classifier)

- Removal of an existing building
- Removal of trees prior to construction
- Presence of trees on the building site or adjacent site
- Unusual moisture conditions caused by drains, channels, ponds, dams, swimming pools, effluent disposal areas or tanks which are to be maintained or removed from the site.

# Abnormal Moisture Conditions

## Resulting from Construction (builder)

- Failure to provide adequate site drainage
- Failure to detail or construct drainage in accordance with this standard

## After Construction (owner)

- The effect of trees too close to a footing
- Excessive or irregular watering of gardens adjacent to the building
- Failure to maintain site drainage
- Failure to repair plumbing leaks
- Loss of vegetation from near the building

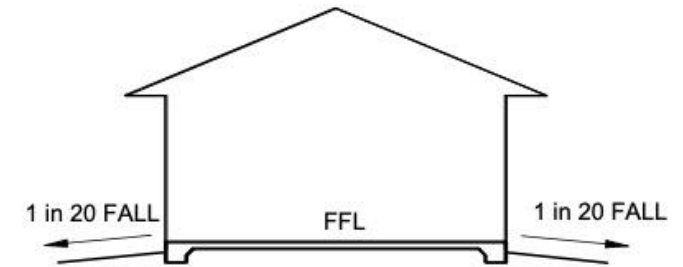
# Drainage Requirements

## 5.6.3 Drainage Requirements

- Surface Drainage from start of construction
- Trench Grade away to prevent ingress of water
- Pipework under using clay plugs
- Subsurface Drainage distance

## 5.6.4 Plumbing Requirements

- Penetrations being lagged
- Attached Drains to incorporate flexible / articulated joints to allow for predicted surface movement
- Onsite wastewater location
- Drainage under the slab to be avoided where practical.
- Cold Water & Heated pipes not under.



MINIMUM 50mm FALL TO BE MAINTAINED FOR  
THE FIRST 1000mm FROM THE DWELLING PERIMETER.

TYPICAL SURFACE DRAINAGE DETAIL

# What do Plastec joints look like?

Clay Plugs



Vertical Expansion Joints



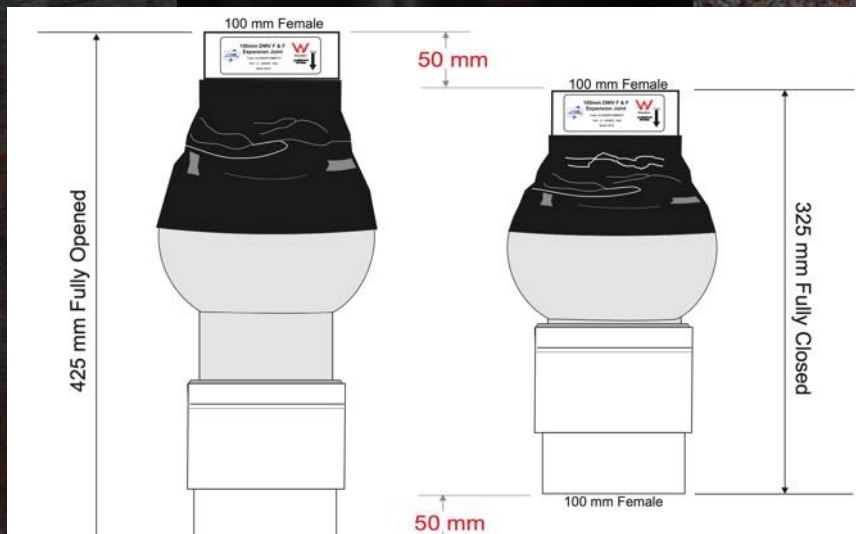
Combination Swivel Expansion Joints



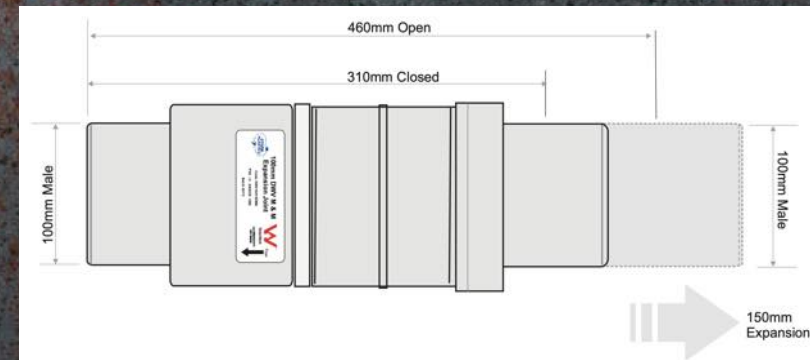


# What do Storm Plastic joints look like?

## Combination Swivel Expansion Joints



## Expansion Joints



## Schedule 6 Documents to accompany permit applications

section 44(1)(b)(i)

### Part 2 Required documents for all applications

#### 2 Documents for work for a class 1a or 10a building

- (1) This section applies to an application for, or to amend, a permit for work, to the extent the work relates to a class 1a or 10a building.
- (2) The application must be accompanied by 1 or more plans of the premises where the building is to be situated showing—
  - (a) the location of the proposed building on the premises; and
  - (b) a floor plan of the proposed building showing any proposed sanitary fixtures; and
  - (c) the elevations of the proposed building.
- (3) If the proposed work involves installing sanitary drainage, the application must also be accompanied by—
  - (a) a site classification report, complying with AS 2870—2011, for the premises; and
  - (b) if the soil classification for the premises under AS 2870—2011 is H, E or P—a design showing the articulation of the sanitary drainage for the premises.

# QLD Plumbing & Drainage Regulations

2018/19 Changes

**GENERAL NOTES:** This form is to be used for the purposes of sections 44(1)(a) and 52(2) of the Plumbing and Drainage Regulation 2019 (PDR). Completion of all applicable sections is mandatory

## 1. Description of land

The description must identify all land the subject of the application. The lot and plan details (e.g. SP/RP) are shown on title documents or a rates notice.

Street address (include number, street, suburb/locality and postcode)

Lot and plan:

Shop/tenancy number

Storey/level

Local government area




(if applicable)

(if applicable)

## 2. Permit application

Subject to section 66(1) of the PDA, a person must not carry out permit work unless the person has a compliance permit for the work and complies with any conditions of the permit.

Is this application for a new building?  Yes  No

Is this application for work to an existing building?  Yes  No

Has distributor-retailer approval been granted? (if applicable)  Yes  No

Is a copy of the connection approval attached? (if applicable)  Yes  No

Sewered or  Unsewered

Provide details of the proposed plumbing work:

## 3. Classification of buildings and structures

Indicate the class of buildings and/or structures as set out under the National Construction Code building classifications. For example, a house (class 1a), an apartment (class 2) or a domestic shed (class 10a).

Class of building/s (if known)  Class 1a or 10a or  Class 1b, 2 - 9

Provide description (purpose) of the proposed building

*Note - The description must be sufficient to identify the building/s: a single dwelling, bakery, distillery, mechanical workshop etc.*

## 4. Application type

If this application is for a new class 1a or 10a building and you have answered yes to all questions in box A or B in this section, this application may be fast tracked.

*Local governments may opt out or include extra types of permit work under the fast track application process*

*Check with the relevant local government to see if any changes have been made.*

### Box A

Each new building directly and separately connects to the reticulated water supply system and sewerage system  Yes  No

A trade waste approval is not required for this property/building  Yes  No

This application does not include an on-site treatment facility  Yes  No

### Box B

This work is covered by a local government fast track declaration  Yes  No

*Note - Class 1a and 10a properties or buildings with an on-site sewerage facility, trade waste connection or combined or community sanitary drainage are **excluded** from the fast track process and must be assessed as a standard application as must all other properties/buildings (class 2 – 9).*

## 5. Soil classification

A copy of the soil classification report must be supplied where the work involves sanitary drainage.

For classes H, E and P a copy of the articulation report must also be supplied.

<input type="checkbox"/> No sanitary drainage	<input type="checkbox"/> Class A	<input type="checkbox"/> Class S	<input type="checkbox"/> Class M/MD
<input type="checkbox"/> Class H1/H1-D	<input type="checkbox"/> Class H2/H2-D	<input type="checkbox"/> Class E/EE-D	<input type="checkbox"/> Class P

A copy of the soil classification report is attached  Yes  N/A

A copy of the articulation report is attached (for classes H,E&P)  Yes  N/A

## 6. Fixtures to be installed

Indicate the number of fixtures to be installed:

sinks:	basins:	urinals:
baths:	W.C.s:	showers:
laundry tubs:	other:	
Total number of fixtures:		

## 7. Water supply

Examples of supply details may include dual reticulation or recycled water.

**If the application is for a new connection, or disconnection of an existing water service, complete the following:**

(a) purpose of the water service (tick applicable boxes)

domestic  industrial  commercial  fire

(b) nature of the work (tick applicable boxes)

new  alteration  disconnection

*Note - SEQ local governments cannot grant a permit unless the distributor-retailer has approved the associated connection, connection change or disconnection to its water infrastructure; or it is a class of work that does not require distributor-retailer approval (Plumbing and Drainage Regulation 2019, section 44).*

## 8. Disposal of wastewater in unsewered area

A Treatment Plant Approval (TPA) number/Chief Executive Approval (CEA) or Environmentally Relevant Activity (ERA) number must be included for any on-site sewerage treatment plant or greywater treatment plant.

A copy of the site and soil evaluation report must be attached.

Description of work

New facility  Replace existing facility  Connect to existing  
 The treatment plant is for testing purposes

Type of treatment plant

Secondary on-site sewerage treatment plant  Greywater treatment plant  Greywater diversion device  
 Septic tank  Holding tank  Composting toilet

Brand: \_\_\_\_\_ Model: \_\_\_\_\_

TPA/CEA Number \_\_\_\_\_  
 (Treatment Plant Approval or Chief Executive Approval Number)

ERA Number (if applicable) \_\_\_\_\_  
 (Environmentally Relevant Activity number)

Additional information

Total number of bedrooms in all dwellings to be serviced by the facility \_\_\_\_\_

Total wastewater flow per day to be serviced by the facility \_\_\_\_\_ L/day

A copy of the site and soil evaluation report is attached  Yes

Comments (i.e. conversion from septic to treatment plant.)



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.</p> <p>A recognised expert may be a licenced plumber for A, S, M, H1, H2, and E sites.</p> <p>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.**

**Issue:** Requirement for the installation of drainage on “other than stable ground” (filled ground etc.)

**To:** Licensees / Contractors / the Plumbing and Drainage Industry

**From:** PIAS, Better Regulation Division, Parramatta

**Date:** May 2021

**Scope:** Applies to all of NSW.

**Purpose:**

To clarify, what is the acceptable practice when drainage pipework has been installed internal or external to a building, on ground considered as “other than stable ground”.

**Detail:**

**AS/NZ.3500 Part 2 - Sanitary plumbing and drainage**

**5.6 Drains In Other Than Stable Ground**

Where drains are to be laid in filled, unstable or water-charged ground, methods of support and bedding shall be designed to withstand and suit the ground conditions.

**4.3.1(d)** Drains below ground shall;

(d) be continuously supported under the barrel, other than for cast iron and ductile iron pipes and fittings.

**Solution:**

There are 2 options available when installing drains that are considered in “other than stable grounds”:

**Option 1:**

If the soil has been compacted and can suitably support the pipework without additional support, as required by AS/NZ 3500.2 – 4.3.1, the installation would then meet minimum requirements.

This would require the submission of a letter to the regulator from a “qualified expert”, structural engineer or similar outlining their qualifications and including a statement verifying that:-

“The ground in the immediate area of / under the drainage pipework will adequately support the pipes with the maximum load imposed by the backfill or any other superimposed load without additional support.”

**Option 2:**

If the ground does not prove stable or suitable to continuously support the pipework, a method to support the pipework is required to be determined by a suitably qualified expert.

This would require a Performance Solution to be submitted on how the pipework will be supported.

NOTE: A Performance Solution shall be submitted a minimum of 21 days prior to the supposed works being carried out.

For more information regarding the submission of a Performance Solution, click [here](#).

# AHSCA FAQs

•If the site is called up a P site and no differential movement (Ys) is called up should a E Classification be used?

Adopting an E solution may be the best approach depending upon scale. With small projects simply adopting worst case may be easier but for larger jobs determining why it is a P class site would help to better define the extent of expansion & swivel joints that are necessary.

•If the site boundary is within 1m of the building it is difficult install the expansion joints directly outside the building?

AS2870 clause 5.6.4 (d) states

*“Drainage under a slab shall be avoided where practicable”*

Redirecting drains to avoid the edge beam / adjoining structure being undermined or not having enough horizontal clearance to allow for the installation of external joints if critical.

## Drainage Reality - Zero Lot Alignments

The drainage of zero lot line sites may pose special problems. The Committee considered that there is not sufficient experience with zero lot line construction to enable specific requirements to be included in the Standard. It is also recognized that zero lot line construction on reactive clay sites has the potential to create problems that involve a complex mix of technical and legal aspects.



# AHSCA FAQs

- Are expansion joints required under a building in a normally dry environment?

If little or no moisture change takes place under & to the perimeter of a slab, in theory no or nominal change in slab levels nor drains movement would be expected (Eg. An A or S sites). Joints under all slabs H1, H2 or E sites may be appropriate as per AS3500 Appendix G. Most critical is with P class site where it is reasonable that differential settlement is expected between slab over relative to slab under. Eg. Slab on piles will settle at a different rate to under slab drains.





# AHSCA FAQs

- What design methodology is required for reactive soils with spring water or other permanent wet soil under hydrostatic slabs?

Abnormal moisture conditions are a trigger for a P site classification. The most likely failure mode for such a site is edge heave. Controlling both surface & ground water is critical for the long-term stability of the structure is critical. Subsurface drains with suitable fall to the legal point of discharge is a common solution. Minimising drains to this side of the dwelling or limits drains passing under edge beams on this side of the dwelling is also key.

# AHSCA FAQs

• Is 1m internal of building perimeter considered stable? What is the zone of influence around the perimeter of a building?

AS2870 Appendix F covers the Walsh method of analysis based upon a reduced surface movement ( $y_m$ ) internally beyond the edge strip distance. This  $e$  value varies depending upon edge or centre heave model,  $H_s$  & original  $y_s$ .

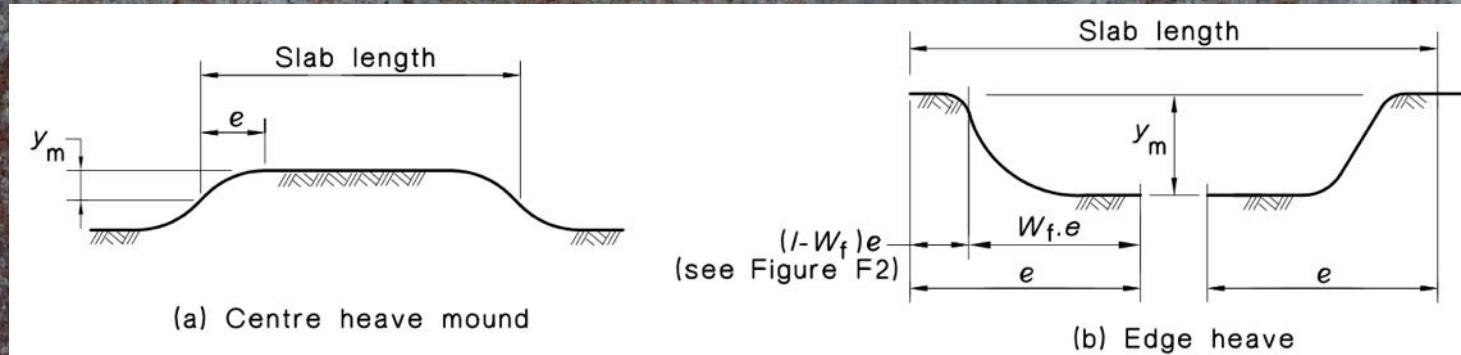


FIGURE F1 IDEALIZED MOUND SHAPES TO REPRESENT DESIGN GROUND MOVEMENT (WALSH METHOD)

	Walsh method	Mitchell method
Centre heave	$0.7y_s$	$0.7y_s$
Edge heave on initially dry site	$0.5y_s$	$0.7y_s$

(b) *Edge distance* The edge distance ( $e$ ), is taken as:

(i) For centre heave, in metres:

$$e = \frac{H_s}{8} + \frac{y_m}{36}, \text{ where } y_m \text{ is in millimetres and } H_s \text{ is in metres} \quad \dots \text{ F4(1)}$$

(ii) For edge heave, in metres:

$$e = 0.2L \leq 0.6 + \frac{y_m}{25}, \text{ where } y_m \text{ is in millimetres} \quad \dots \text{ F4(2)}$$

# AHSCA FAQs

- Are expansion joints required outside the building under an impervious slab?

AS2870 Clause 5.6.4 (b) states

*“Drains attached to or emerging from underneath the building shall incorporate flexible joints immediately outside the footing and commencing within 1m of the building perimeter .....*”

In short, yes these joints are required for H1, H2 & E reactivity sites.

- What precautions should be undertaken during the construction of a new building during wet conditions?

AS2870 Clause 5.6.3 (a) states

*“...Surface drainage of the site shall be controlled from the start of the site preparation and construction. The drainage of the site shall be completed by the finish of construction of the building”*

At the time of the initial site cut, site drainage needs to be established & maintained. Pretty simply stuff but not commonly adhered to.

# AHSCA FAQs

•Is vertical expansion required for vertical risers for H1, H2 and E for existing buildings?

For rectification works on existing structures I would always recommend that the plumber incorporates flexible / expansion joints in any new plumbing Works. It is most likely you are now working with a P class so

•If there is sanitary drainage located under a floor slab inground and there is the possibility that the soil can fall away exposing the sanitary drainage should the sanitary drainage be supported by a single rod or a two rods with a pipework clamp. – or other methodology? Is strapping/support required to prevent movement/sagging below slab?

The use of underslab strapping may be a suitable alternative solution to utilise instead of mass adoption of vertical expansion joints. In summary if underslab drainage is supported by the slab over to ensure that they move together will either negate or minimise the need for vertical expansion joints.

# AHSCA FAQs

•If a drain is passing from one side of a building to another over-excavation of the trench may be required to prevent trench sloping under building, or is a clay plug enough?

As2870 Clause 5.6.3 ( c)

*“Where pipes pass under the footing system, the trench shall be backfilled full depth with clay top act as a barrier to the ingress of water beneath the footing system.....”*

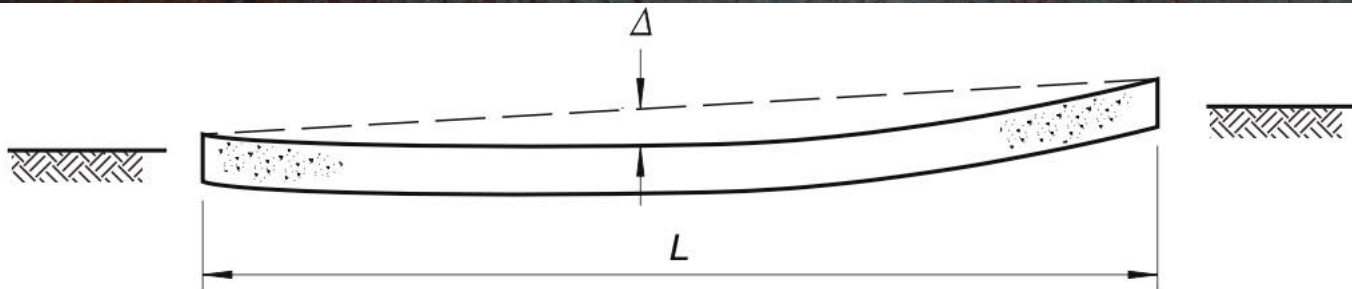
The “clay plug” to preventing water entry into trenches & under the slab is essential. This is most critical to the cut side of the site. Fall of these trenches (internal & external) are also so very critical to preventing water entry.

•Should we consider backfall if two articulation joints are installed in line on grade?  
ie. Figure G.4

Twin combo / swivel joints simply provide a joint more capable of preventing damage. Backfall of trenches / joints is still warranted when compared to the predicted surface movement.

## Trench Grade Reality Check

- **100 mm Dia Min 1.65 % Grade**  
**1 in 60 Fall or 16mm per metre**
- **1 in 40 Fall over 800mm is 20mm.**
- **May be an issue with predicted surface movements of;**
  - 40mm for M sites
  - 60mm for H1 sites
  - 75mm for H2 sites
  - > 75mm for E sites



**TABLE 6.3**

**MINIMUM GRADES OF DISCHARGE PIPES**

Size of graded section of pipe DN	Minimum grade %
40	2.50
50	2.50
65	2.50
80	1.65
100	1.65
125	1.25
150	1.00
225	0.65
300	0.40

**Conversion of pipe grades**

Percentage, %	Ratio (gradient)
20.00	1 in 5
6.65	1 in 15
5.00	1 in 20
3.35	1 in 30
2.50	1 in 40
2.00	1 in 50
1.65	1 in 60
1.45	1 in 70
1.25	1 in 80

# AHSCA FAQs

- If an area has been reclassified due to site rectification (new fill/compaction test) and drainage passes out of this area, should we include articulation?

If site is reclassifying a site from P to its reactivity class (M, H1 etc) after provision of a level 1 fill report, standard reactivity plumbing / drainage requirements only would apply.

If is the result of other factors such as trees, poor bearing etc other considerations would also apply. Knowing why the P classification was derived is essential.

- Is AS 2870 applicable for commercial design? (more of a comment really)

AS2870 Clause 1.1 states

*“...The Standard may also be used for other forms of construction, including some light industrial, commercial and institutional building if they are similar to houses in size, loading and superstructure flexibility. ....”*

As such it does have a place, as a guide / reference if not covered in AS3500.

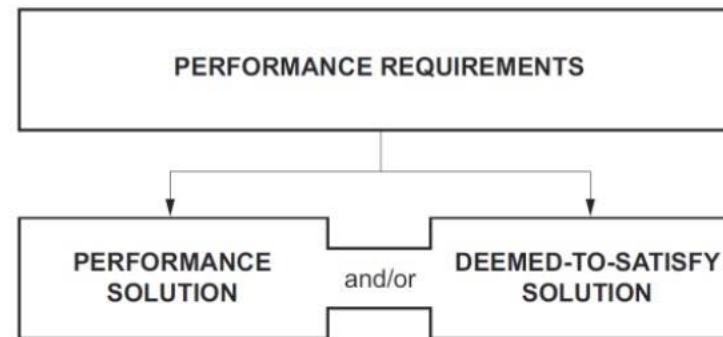
# Should we be considering.....

- Better quality site classification reports needing to include;
  - Why is this a P?
  - What additional testing is required (if any)?
  - Allowable bearing pressures
- Grading or stepping under slab trenching instead of just grading pipes.
- Adopted greater than the minimum grades.
- Verification of Flexible / Articulation joints to be verified at time of plumbing inspection





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Thankyou

Any Questions?

E : [tim@awgeotechnics.com.au](mailto:tim@awgeotechnics.com.au)

P: 07 3343 6500



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