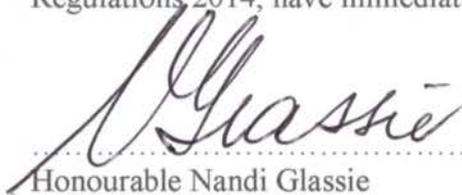


APPROVED STANDARDS APPLICABLE TO THE DESIGN AND CONSTRUCTION OF SEWAGE SYSTEMS

THE DESIGN AND CONSTRUCTION STANDARDS

These Standards have been approved under section 16 of the Ministry of Health Act 2013, and apply to all sewage systems designed for use in the Cook Islands, and that are regulated by the Public Health (Sewage and Wastewater Treatment and Disposal) Regulations 2014.

These Standards are dated this *18th* day of *June* 2014 and, subject to regulation 2 of the Public Health (Sewage and Wastewater Treatment and Disposal) Regulations 2014, have immediate effect.



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Honourable Nandi Glassie
Minister for Health

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1. Application of these standards

- 1.1 These standards may be referred to as the “Design and Construction Standards”, and are to be read and applied in conjunction with other approved standards, including –
- (a) the “Operating, Testing and Reporting Standards”; and
 - (b) the “Standards for Registration”.
- 1.2 These standards are made in support of the Public Health (Sewage and Wastewater Treatment and Disposal) Regulations 2014, and are approved standards for the purposes of those Regulations.
- 1.3 Unless otherwise stated, these standards apply to all of the following –
- (a) all sewage systems which are designed for use or application in the Cook Islands;
 - (b) all sewage systems, and parts of such systems, which are constructed in the Cook Islands, and which are regulated by the Public Health (Sewage and Wastewater Treatment and Disposal) Regulations 2014;
 - (c) all registered designers of treatment units, and all other persons who design any sewage system specifically for use in the Cook Islands;
 - (d) all other persons registered under the Public Health (Sewage and Wastewater Treatment and Disposal) Regulations 2014, and who perform any work in relation to the design or construction of any sewage system;
 - (e) the owner of any premises at which a sewage system which is regulated by the Public Health (Sewage and Wastewater Treatment and Disposal) Regulations 2014 is constructed, or proposed to be constructed;
 - (f) any person who constructs a sewage system which is regulated by the Public Health (Sewage and Wastewater Treatment and Disposal) Regulations 2014, and any person who has responsibility for any such construction, or any aspect of it.

2. Applicable standards for the design and construction of all sewage systems

- 2.1 Subject to 2.6, the design and construction of all sewage systems must be in compliance with the relevant standards and codes in relation to all of the following –
- (a) AS/NZS 1547:2012 - On-site domestic-wastewater management
 - (b) AS/NZS 3500 - National plumbing and drainage code
 - (c) New Zealand Building Code G13 - Foul Water and E1 Surface Water
 - (d) AS/NZS 1546.1:2008 - On-site domestic wastewater treatment units Part 1: Septic tanks
 - (e) AS/NZS 1546.2:2008 - Waterless Composting Toilets
 - (f) AS/NZS 1546.3:2008 - Aerated Wastewater Treatment Systems
 - (g) All provisions of the Public Health (Sewage and Wastewater Treatment and Disposal) Regulations 2014.
- 2.2 Aeration treatment plants designed for individual homes must meet the requirements specified in AS/NZS 1546.3:2008

- 2.3 Septic tank manufacturers must construct septic tanks to meet *AS/NZS 1546.1:2008 - On-site domestic wastewater treatment units Part 1: Septic tanks*.
- 2.4 Copies of the AS/NZS standards can be accessed at <http://www.dbh.govt.nz/building-code-compliance-documents#free-download> or www.standards.co.nz. Hard copies to be made available at Community Health Services Directorate of the Ministry of Health for public perusal.
- 2.5 Copies of the Public Health (Sewage Treatment and Disposal) Regulations 2014 may be purchased from Legislative Services, Rarotonga, Cook Islands.
- 2.6 The principles of AS/NZS 1547:2012 and the specifications described in Table 1 must be applied and complied with when designing or constructing a sewage system. In cases where the specifications in Table 1 differ from the specifications in AS/NZS 1547:2012, the specifications in Table 1 prevail.

Table 1 – Specifications for the design and construction of sewage systems

Part 1 - Outside Lagoon Protection Zones	
Low Load (<2000 L/day)	<ul style="list-style-type: none"> • Primary treatment with septic tank filter or better. • Soak pits prohibited • Land application methods with loading rates in accordance with AS/NZS 1547:2012
Moderate Load (2000 – 10,000 L/day)	<ul style="list-style-type: none"> • Advanced treatment • TN before application to land less than 30 mg/L • Land application methods with loading rates in accordance with AS/NZS 1547:2012
High Load (>10,000 L/day)	<ul style="list-style-type: none"> • Advanced treatment • TN before application to land less than 30 mg/L • Land application methods with loading rates in accordance with AS/NZS 1547:2012
Part 2 - Within Lagoon Protection Zones	
Low Load (<2000 L/day)	<ul style="list-style-type: none"> • Secondary treatment or better. • Soak pits prohibited • Land application methods with loading rates in accordance with AS/NZS 1547:2012
Moderate Load (2000 – 10,000 L/day)	<ul style="list-style-type: none"> • Advanced treatment

	<ul style="list-style-type: none"> • TN before application to land less than 25 mg/L • Land application methods with loading rates in accordance with AS/NZS 1547:2012
High Load (>10,000 L/day)	<ul style="list-style-type: none"> • Advanced treatment • TN before application to land less than 20 mg/L • Land application methods with loading rates in accordance with AS/NZS 1547:2012
<p>Note: No surface ponding or liquid breakout is allowed on any land application system. For Lagoon Protection Zone: subsurface irrigation is permitted with DIR to be less than 8 mm/day</p>	

- 2.7 Sewage systems must be designed and constructed so that sewage must not under any circumstances be discharged to surface water.
- 2.8 Sewage systems must be designed and constructed so that sewage must not be discharged directly to groundwater but must be treated and applied to land as outlined in all approved standards.

3. Requirements in Lagoon Protection Zones and Critical Protection Zones

- 3.1 The Lagoon Protection Zones are areas where higher standards of sewage treatment are needed to protect the coastal lagoon from sewage pollution. For the purposes of this provision, Lagoon Protection Zones are as follows –
- (a) the Lagoon Protection Zone on Rarotonga is located around the coast and is defined by those areas where the soil type is characterised as Koromiri soils, Muri soils stony phase, Vaikai soils and Vaikai soils mottled phase. (Application for Sewage Construction Permits on Vaikai Soils and Vaikai Soils mottled phase may frequently be declined due to the vulnerability of the sewage system to flooding in these zones).
- (b) the Lagoon Protection Zone on Aitutaki is located wherever the soil type is either category 1, 2, 5 or 6 as described in AS/NZS 1547:2012.
- 3.2 For those properties where the boundary of the Lagoon Protection Zone cuts through the property, the location of the effluent land application area within the property shall determine whether or not the sewage system is located within the Lagoon Protected Zone. If the effluent land application area is within the Lagoon Protection Zone, then the sewage system shall follow the rules for sewage systems located within the Lagoon Protection Zone.

- 3.3 Critical Protection Zones are areas where additional environmental, and/or public health requirements should prevail. The decision to authorise such zone and additional requirements are to be determined by the Ministry of Health, Sewage and Sanitation Board with any other competent authority as may be required from time to time and as the need arises.

4. Required septic tank capacities

- 4.1 The design and construction of septic tanks must be in compliance with the required capacities specific in Tables 2 – 4.

Table 2: All-Waste Septic Tank Capacities

Number of persons	Average daily flow (litres)	Tank capacity (litres)
1-10	Up to 2000	4500

- 4.2 For 11-20 persons (inclusive), the capacity C of a septic tank is to be determined by the following formula provided that the total flow does not exceed 2,000litres/day on any day:

$$C = (P \times A) + 2000 \text{ litres}$$

Where P = the number of persons to be served and A = the daily wastewater flow allowance in litres/person/day as outlined in Table 5 – “Occupancy Allowances” and Table 6 – “Wastewater Flow Design Allowances”

- 4.3 In the case of 20 or more persons, if the flow is calculated to be more than 2,000 litres per day, primary treatment and then drainage to a land application system is not permitted. Advanced treatment is required for flows of more than 2,000 litres per day.
- 4.4 The minimum capacity tank for any domestic greywater on-site application is set at 1,800 litres. The 1,800 litre greywater tank allows for an approximate 24-hour settling volume, plus an allowance of 8 hours hydraulic buffering volume for the daily greywater flows from 5 persons. About 1,000 litres capacity is allowed for sludge and scum accumulation over a 5-year period.

Table 3: Greywater Septic Tank Capacities

Number of Persons	Average daily flow (litres)	Tank capacity (litres)
1-5	Up to 600	1800
6-10	600-1200	2700

- 4.5 The minimum capacity tank for any domestic blackwater on-site application is set at 1,500 litres. The 1,500 litre blackwater tank allows for an approximate 24-hour settling volume for the daily water-closet flows of 5 persons. About 1,200 litres capacity is allowed for scum and sludge accumulation over a 5-year period.

Table 4: Blackwater Septic Tank Capacities

Number of Persons	Average daily flow (litres)	Tank capacity (litres)
1-5	Up to 300	1500
6-10	300-600	2500

4.6 The occupancy allowances and design flow allowances for wastewater flow design shown in Tables 5 and 6 are adapted from Chapter 6 of the Auckland Regional Council Technical Publication 58 (TP58). The occupancy allowances and design flow allowances in AS/NZS 1547:2012 do not apply in the Cook Islands.

5. Occupancy and Wastewater Flow Allowances

Table 5 – Occupancy Allowances

Facility	Occupancy for Design Purposes
Homes	
Number of Bedrooms (Notes 1, 2 & 3)	
1	2
2	4
3	5
4	6
5	8
6	9
Hotels and Motels	
Guests	Maximum Occupancy/Number of beds (Note 3)
Staff	Maximum Number of Staff
Hospitals (Note 4)	
Patients	1 per bed
Staff	Maximum Number of Staff

Notes:

1. It is usual to adopt a minimum occupancy of 4 persons (equivalent to a 2 bedroom dwelling) for existing rural residential cluster developments.
2. In situations where large modern dwellings are proposed which have additional rooms beyond those allocated as dining, lounge, bedrooms, e.g. "family", "recreation", "games", "office", "study", "sewing", "work", rooms) which could have potential to be utilised as bedrooms with different furnishings, an additional occupancy is to be made on the basis of 1 extra person times the ratio of the total floor area of the additional room(s) to that of the smallest designated bedroom and rounded up to the next whole number.
3. Design occupancy should allow for a seasonal peak, not just the average daily flow. Holiday homes tend to have intermittent occupancy but when occupied are likely to have a higher occupancy than a continuously occupied dwelling. An allowance in design occupancy should be made for the seasonally higher flows.
4. Occupancy data in this table is from the literature and observed levels. A higher water use/person should be allowed in facilities providing community care unless specific water meter data is available.
5. In the event that the designer does not design for the predicted flow from the full potential occupancy, it will be necessary to record wastewater discharge flows and submit to Public Health.

Table 6 - Wastewater Flow Allowances - Per Capita

Source	Typical Wastewater Flow Allowance	
	Litres/Person/Day	[Note 1 and Note 2]
	On-site Roof Water Tank Supply	Reticulated Community or Bore Water Supply
Flow Allowances		
A. Upmarket Luxury Households with Extra Wastewater producing fixtures including fixtures such as garbage grinders, dishwashers, modern shower or bath facilities or other comparable fixtures [Note 4]	220	220
B. Households with Standard Fixtures including 11 litre flush water cisterns; automatic washing machine and dishwasher [Note 3 and Note 5]	180-200	200
C. Households with 11/5.5 or 6/3 Flush Toilet(s) and Standard Fixtures , low water use dishwasher and NO garbage grinder [Note 3 and Note 6]	160	180
D. Households - Blackwater Only (Based on an 11 litre flush toilet) [Note 7]		66
E. Households - Blackwater Only (Based on a 11/5.5 flush toilet)		45
F. Households - Blackwater Only (Based on a 6/3 flush toilet)		25
G. Households - Greywater Only [Note 8]	100	120
Commercial Flow Allowances for Standard Fixtures		
Motels/Hotels [Note 9]		
- Guests, resident staff		220
- Reception rooms		30
- Bar trade (per customer)		15 to 20
- Restaurant (per diner)		30
Restaurant/Bar/Café [Note 10]		
- Per dinner patron		30
- Per lunch patron		25
- Per bar patron		15 to 20

Lunch Bar (per customer)		
- Without restroom facilities	10	15
- With restroom facilities	15	25
Community Halls		
- Banqueting	20	30
- Meetings	10	15
Hostels [Note 11]		
- Day only visitors		40
- Day plus overnight visitors		150
Schools (pupils plus staff) [Note 12]	12 to 15	15 to 20
Public Toilets (including hand wash – no showers) [Note 13]	10 to 20	10 to 20
Rest Homes/Hospitals [Note 14]	220	250
Day Staff		
- High Water Usage e.g. some factories [Note 15]		60
- For ALL Standard Facilities (above)		40

Notes:

1. These flows are recommended minimums for design purposes (unless actual comprehensive water usage/flow records along with actual occupancy numbers are available). In some instances ranges of design flow rates are provided to reflect the inherent uncertainty associated with actual per capita wastewater production.
2. Where a site is reliant on water being supplemented by water tanker, the design flow allowances based on reticulated water supply must be applied.
3. Use of the reduced household flow allowances (<200litres/person/day and split grey/blackwater systems) applies to on-site system designs for dwellings with special approval from the Sewage and Sanitation Board.
4. Extra Wastewater producing fixtures include fixtures such as garbage grinders; dishwashers, modern shower or bath facilities or other comparable fixtures.
5. These include 11 litre flush water cisterns; automatic washing machine and dishwasher. No garbage grinder unless other water saving measures such as low flush 6/3 litre toilet cisterns.
6. Standard Fixtures include dual flush 11/5.5 or 6/3 litre toilet cisterns, and includes standard automatic washing machine, but a low water use dishwasher, no garbage grinder.
7. Flow rates to be applied where only the blackwater from toilets is to be treated and discharged to land disposal.
8. Flow rates to be applied where only the greywater is to be treated and discharged to land disposal. The lower design flow is only to be applied where there is no bath. Applicable where solids from kitchen and toilet waste flows are excluded from the wastewater stream.
9. Evidence does not support lower water usage by staff or guests of commercial premises, so no differentiation is made to the flow allowances according to the water supply source. Some reduction (up to 25%) may apply to the per guest water usage allowance if laundry, is undertaken off-site.
10. Evidence does not support lower water usage between roof water and reticulated water supplies usage by staff or guests of commercial premises, so no differentiation is made to the flow allowances according to the water supply source. For bar patrons, it is assumed that there is minimal if any food served, other than odd bar snacks. Where meals are served, meal water usage allocations apply per patron. In bar facilities, where water full reduction fixtures are installed on all water usage outlets and patrons are only present for short periods, a water usage allowance of 10 litres per person may be appropriate.
11. Assumes that lunches and lunch/dinners will be served, and that overnight visitors have access

to showers but not to laundry facilities. Water meter readings should be installed to provide added certainty to the accuracy in the design flow allowance. The designer should be aware that water conservation measures installed in commercial premises e.g. bars, restaurants may not provide the same level of savings as achieved by domestic uses. Unless specific metered water consumption information is available conservative flow allowances should be applied. In the instance of laundry facilities being supplied, recommended flow allowances for households should be used or alternatively on flow meter rates where these are available.

12. Based upon experience in the Auckland area, these values for schools are conservative. Recorded flows appear to be up to 15 litres/person/day on rainwater tank supply, and 15 to 20 litres/person/day on community or borewater supply. For design purposes, figures from the lower end of the range should be supported by actual water usage records otherwise the higher figure should be used. Additional allowances also need to be made in the design flows for schools that also have cafeteria (with on-site catering) and/or gyms with shower facilities.
13. For low water use toilets with 6/3 litre flush cisterns, standard dual flush public toilets (no showers), the lower end of the range applies; for standard and modern upmarket toilet facilities, the higher range applies.
14. Flow allowances for individual dwelling within a retirement village may be based on the recommended flow allowances for households or alternatively on flow meter rates where these are available. Where extra care facilities are provided the actual per capita rates will be higher than standard rates provided and a conservative design allowance should be applied.
15. Increased water usage allowances are appropriate where staff activities likely to involve regular cleaning of themselves and/or the facilities e.g. rural food preparation factory. Where staff are likely to use showers, the designer should consider all the activities being undertaken by staff and rates higher than 60 litres per person per day may apply.

6. Standards for drain laying

All drain laying must comply with the AS/NZS 3500 *National plumbing and drainage code standards*, or the New Zealand Building Codes E1 *Surface Water and G13 Foul Water standards*.

7. Treatment Unit Categories and Effluent Quality Standards

- 7.1 As a guide, raw sewage has a biochemical oxygen demand (BOD₅) and Total Suspended Solids of TSS of 300 - 400mg/litre and a faecal coliform count of 10⁸-10¹⁰ cfu/100ml.
- 7.2 Samples must be collected over one test period consisting of three consecutive days during peak flow on each day (and in the case of visitor accommodation, during 75% to 100% capacity) as outlined in the testing requirements specified in the Operating Standards.
- 7.3 The effluent standards for each category of system are as specified in Table 7.

Table 7 – Prescribed effluent standards

Treatment level	Effluent standards
Primary treatment	<ul style="list-style-type: none"> • BOD₅ - no sample must exceed 150mg/litre • TSS - 90% of samples must not exceed 80mg/litre and no sample must exceed 100mg/litre

	<ul style="list-style-type: none"> • FC - the median value must be no more than 10^5 cfu/100ml and no sample must exceed 10^7 cfu/100ml.
Secondary treatment	<ul style="list-style-type: none"> • BOD5 - 90% of samples must not exceed 20mg/litre and no sample must exceed 30mg/litre. • TSS - 90% of samples must not exceed 30mg/litre and no sample must exceed 45mg/litre. • FC - If disinfection is provided, the samples taken on each occasion must have a thermo tolerant coliform count not exceeding a median value of 10^2 organisms per 100ml with 80% of the samples containing less than 10^3 organisms per 100ml and no sample exceeding 10^4 organisms per 100ml. • TN - 90% of samples must not exceed 40mg/litre and no sample must exceed 60mg/litre. If chlorination is the disinfection process, the total chlorine concentration must be greater than or equal to 0.5mg/litre in four out of five samples taken.
Advanced treatment	<ul style="list-style-type: none"> • BOD5 - 90% of samples must not exceed 10mg/litre and no sample must exceed 20mg/litre. • TSS - 90% of samples must not exceed 10mg/litre and no sample must exceed 20mg/litre. • FC - The samples taken on each occasion must have a thermotolerant coliform count not exceeding a median value of 10 organisms per 100ml with 80% of the samples containing less than 20 organisms per 100ml and no sample exceeding 100 organisms per 100ml. • TN - 90% of samples must not exceed 15mg/litre and no sample must exceed 20mg/litre. • TP - 90% of samples must not exceed 5mg/litre and no sample must exceed 10mg/litre. • If chlorination is the disinfection

	process, the total chlorine concentration must be greater than or equal to 0.5mg/litre in four out of five samples taken.
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8. Alternative wastewater management systems

- 8.1 There may be proposals that depart from these approved specifications. These might include –
- (a) stream separation systems (such as greywater, blackwater, urine);
 - (b) dry systems (such as composting toilets);
 - (c) greywater treatment using constructed wetlands;
 - (d) other recognised and accepted systems using any other appropriate technology or process.
- 8.2 The Board has authority to approve alternative systems, and such approvals must be assessed against the following criteria -
- (a) site conditions – more stringent performance criteria may be imposed if:
 - (i) the proposal is within the lagoon protection zone;
 - (ii) the proposal is on free draining soils with high water table;
 - (iii) the proposal is on poorly draining soils or floodzone.
 - (b) there must be a very low health risk to users, neighbours, community, lagoon users over the life of the service;
 - (c) there must be a very low risk of impact on connected land and aquatic ecosystems in terms of ecosystem goods, services, and products and integrity of habitats over the life of the service;
 - (d) there must be a very low risk of nuisance factors, over the life of the service, including odours, attraction of flies and pests, noise and obstructions to views and unsightly impacts;
 - (e) efficient resources use must be promoted, particularly in relation to the use of energy;
 - (f) system resilience to variable loading (i.e. variable daily/seasonal quality and quantity) must be demonstrated;
 - (g) affordability considerations must be taken into account, including annual costs over the life of the system.
- 8.3 Applicants are required to clearly demonstrate all of the criteria specific in 8.2, using scientific evidence and principles, and in the context of Cook Islands social and biophysical conditions.
- 8.4 In addition to the above criteria, the application must be supported with the following documentation -
- (a) system specifications including system capacity (average and short-term peak loading);
 - (b) scaled drawing of system;
 - (c) test performance results (preferably from an independent and certified testing agency);
 - (d) independent system certification by an approved agency;
 - (e) operator/owner manual and servicing and maintenance manual;

- (f) warranty details;
- (g) designer producer statement;
- (h) 3 to 4 referees.

8.5 All alternative systems are required to meet required setbacks as specified in the approved standards.

9. Applications for Sewage Construction Permits (and approved fees)

9.1 It is important that applications for sewage construction permits be made on the island where the sewage system is being installed, whenever this is consistent with the regulations and approval processes. This is because the approval process requires some knowledge of the site conditions such as soil permeability, baserock/impermeable layers of the soil profile, groundwater depth etc. In addition, applications for Moderate Load and High Load systems are more complex and will require additional knowledge during the approval process. For this reason, applications for Moderate Load and High Load systems on all islands must be made at the Ministry of Health in Rarotonga in consultation with the Sanitary Inspectors and Island Government officials on the respective island.

9.2 The fees to be submitted upon application for a sewage construction permit are as follows

Low Load Systems	\$55
Moderate Load Systems	\$200
High Load Systems	\$500

9.3 The fees cover the costs of a site visit prior to approval of the sewage construction permit, the assessment of the application and a site visit to inspect the system after it is connected and before it is covered. If further site visits are needed, the owner must pay an additional fee of \$25 when application is made for further site visits to be undertaken.

9.4 Moderate and High Load Systems require additional expert assessment which is at the cost of the applicant.

10. Classification of Buildings

10.1 An understanding of the nature of wastewater from a particular building can be gained by collecting information on the type of building that the sewage system will serve. This information can also help to manage situations where a sewage system is designed for one particular class of building, but the use of the building is later changed and the sewage system can no longer cope with the new wastewater flow (for example converting a residential house into a restaurant). Under the Public Health (Sewage Treatment and Disposal) Regulations 2014, no person is entitled to change the use of their building in such a way that the new use will result in additional sewage flow, without the permission of the Public Health Department of the Ministry. A person is changing the use of a building when the new use will result in the placement

of the building in a different class. Therefore, during the application process for a Sewage Construction Permit or Sewage System Modification Permit, every building that is served by a sewage system must be declared as being of a particular class or combination of classes provided for in 10.2.

10.2 The classifications of building are as follows -

- (a) Residential House
- (b) Tourist Accommodation Rental
- (c) Long Term Accommodation Rental
- (d) Office
- (e) Bar
- (f) Restaurant/Cafe
- (g) School
- (h) Factory
- (i) Public toilet
- (j) Service station
- (k) Retail Store
- (l) Laundry
- (m) Gymnasium
- (n) Laboratory
- (o) Hospital
- (p) Health Clinic
- (q) Entertainment Centre
- (r) Church
- (s) Community Hall

11. Positioning of the Land Application System

The Land Application System for every sewage system must be positioned so as to achieve each of the following -

- (a) to maximize the distance between the outlets of the land application system and the seasonal high ground water table;
- (b) to ensure there will be an adequate area of ground with the appropriate soil type for the effluent land application area and reserve area when required;
- (c) to ensure there will be no restrictive soil horizon below the land application system;
- (d) to ensure there will be no barrier to horizontal soil soakage.

12. Setback requirements

12.1 The setback standards require that the sewage treatment unit and land application system must comply with all of the following

- (a) at least 2m from any land boundary;
- (b) at least 3m from any house or building;
- (c) at least 15m from any surface water, groundwater well or bore;
- (d) at least 1m depth of unsaturated soil (depth to the normal high water table) below the land disposal area.

12.2 Installers must comply with the setback requirements stated in 12.1, but in cases where land is limited, the Board has authority to approve alternative setback requirements, it may be in such cases treatment must be improved.

13. Soil classification

13.1 Soils are to be assessed and categorized as specified in AS/NZS 1547:2012 Appendices E to G, with consideration of Appendices A to D.

13.2 For all purposes under the regulations and any approved standards, soils are to be classed in accordance with the criteria stated in Table 8, or alternatively Table E1 – Assessment of Soil Textures in AS/NZS 1547:2012.

Table 8 - Appearance and Feeling of Various Soil Textural Classes

Soil Class	Textural Appearance and Feeling	
	Dry Soil	Moist Soil
Sand	Loose, single grains which feel gritty. Squeezed in the hand, the soil mass falls apart when the pressure is released.	Squeezed in the hand it forms a cast which crumbles when lightly touched. Does not form a ribbon between thumb and forefinger.
Loamy Sand	Loose, single grains, which feel gritty but enough fine particles to stain fingerprints in the palm of hand.	Squeezed in the hand. It forms a cast that crumble when touched and only bears very careful handling.
Sandy Loam	Aggregates are easily crushed. Very faint, velvety feeling initially, but as rubbing is continued; the gritty feeling of sand soon dominates.	Forms a cast that bears careful handling without breaking. Doesn't form a ribbon between thumb and forefinger.
Loam	Aggregates are crushed under moderate pressure; clods can be quite firm. When pulverised, loam has a velvety feel that becomes gritty with continued rubbing.	Cast can be handled quite freely without breaking. Slight tendency to ribbon between thumb and forefinger. Rubbed surface has a broken or rippled appearance.
Silt Loam	Aggregates are firm but may be crushed under moderate pressure. Clods are firm to hard. Smooth, flour-like feel dominates when soil is pulverised.	Cast can be handled very firmly without breaking. Tendency to ribbon between thumb and forefinger with some flaking, greasy feeling, moderately sticky.
Silty Clay Loam	Aggregates are very firm. Clods are hard to very hard.	Cast can be handled very firmly without breaking. Tendency to ribbon between thumb and forefinger with some flaking, greasy feeling, moderately sticky.

Silty Clay		Squeezed with proper moisture content into a long ribbon; sticky feel.
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14. Design Specification of Land Application System

Trenches, beds, ETA, ETS, mounds and subsurface irrigation system must comply with the standards stated in AS/NZS 1547:2012.

TAKE NOTICE that any person to whom these standards apply, who breaches any requirement or obligation under these standards, commits an offence and is liable to be fined up to \$5,000 (or \$10,000 for companies).