No. 9198

Plumbers, Gasfitters and Drainlayers Board

REGISTRATION EXAMINATION, JUNE 2012
CERTIFYING DRAINLAYER

QUESTION AND ANSWER BOOKLET

Time allowed THREE hours

INSTRUCTIONS

Check that the Candidate Code Number on your admission slip is the same as the number on the label at the top of this page.

Do not start writing until you are told to do so by the Supervisor.

Total marks for this examination: 100.

The pass mark for this examination is 60 marks.

Write your answers and draw your sketches in this booklet. If you need more paper, use pages 19–21 at the back of this booklet. Clearly write the question number(s) if any of these pages are used.

All working in calculations must be shown.

Candidates are permitted to use the following in this examination:

Drawing instruments, approved calculators, document(s) provided.

Publications, Acts, Regulations, Codes of Practice, or Standards other than the ones provided are NOT permitted in the examination room.

Check that this booklet has all of 21 pages in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION

Candidates that sat this examination in June 2012 were provided with the following documents:

- ➤ New Zealand Building Code clause E1 Surface Water
- ➤ New Zealand Building Code clause G13 Foul Water
- ➤ New Zealand Building Code clause G14 Industrial Liquid Waste
- ➤ AS/NZS 3500 Part 2: Sanitary plumbing and drainage
- ➤ Safety in excavation for shafts and foundations

SECTION A

QUESTION 1

(a) State why adhering to codes of practice is beneficial if an incident were to occur.

_____

_____

(2 marks)

Answer the following questions in relation to the Approved Code of Practice for Safety in Excavation for Shafts and Foundations.

(b) (i) State what is required where there is any likelihood of air contamination.

_____

(1 mark)

(ii) Give TWO instances when the requirement from (b) (i) should be carried out.

1 _____

2 _____

(2 marks)

(c) Define each of the following types of excavation.

(i) Trench excavation

_____

(ii) Open excavation

_____

(2 marks)

QUESTION 1 (cont'd)

(d) When pumping is being carried out to lower the ground water level, subsidence of adjacent structures may result.

State how the characteristics of the supporting soil may be changed by pumping.

_____

_____

(1 mark)

(e) Give THREE instances when an excavation must be examined by an employer or an employer's representative.

1 _____

2 _____

3 _____

(3 marks)

(f) List FOUR duties of an employer required by the Health and Safety in Employment Act specific to a situation where a hazard cannot be eliminated or isolated.

1 _____

2 _____

3 _____

4 _____

(4 marks)

(g) Give THREE situations where the scene of the accident at which a person has suffered serious harm may be disturbed.

1 _____

2 _____

3 _____

(3 marks)

Total 18 marks

QUESTION 2

(a)   State the meaning of the term ARI 10 years (AEP 10%).

_____

_____

_____

_____

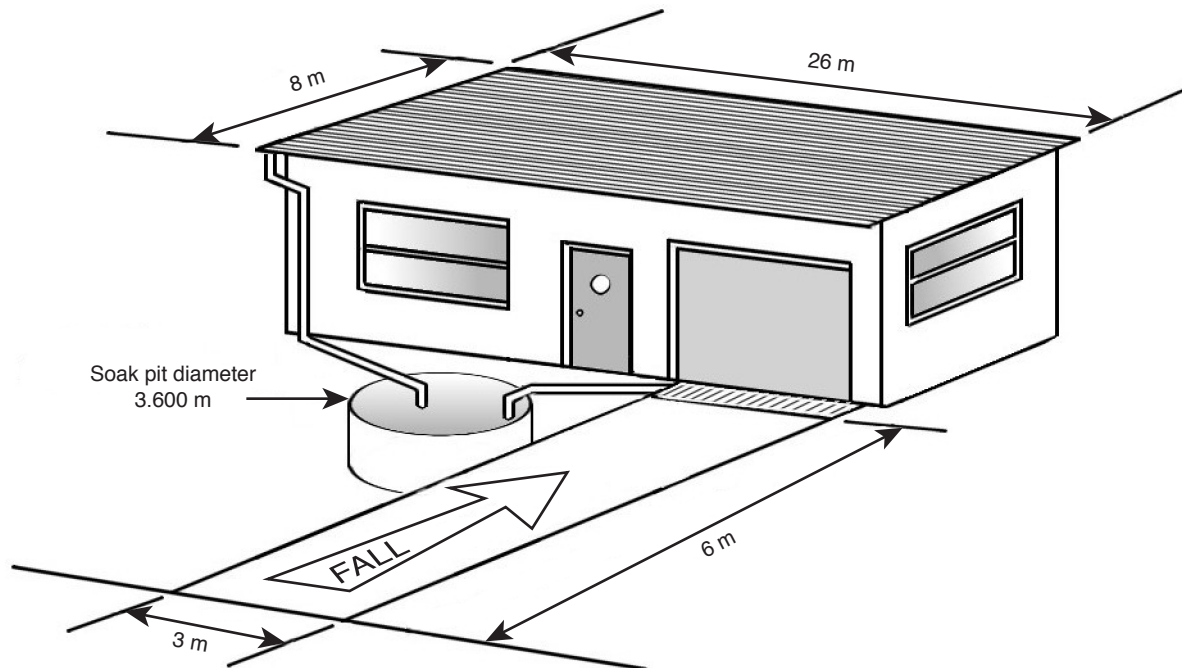(2 marks)

(b)   State the purpose of ARI (AEP).

_____

_____

(1 mark)

Total 3 marks

QUESTION 3

(a) The drawing below shows a house and driveway draining to a rock-filled soak pit.

A percolation (soakage) test of the soil has been carried out and the average water level drop is 0.450 m/h.

The expected rainfall intensity for the area is 0.0348 m/hr.

The flat roof dwelling has been clad with butynol rubber and the driveway is asphalt (tar seal).

Referring to New Zealand Building Code Clause E1/VM1 Surface Water, complete the table on the opposite page.

QUESTION 3 (cont'd)

Calculation	Answer
Catchment area of roof in m²	
Catchment area of driveway in m²	
Run-off coefficient for roof	
Run-off coefficient for driveway	
Expected water run-off from roof in m³/h (= area of catchment in m² × run-off coefficient × rainfall intensity in m/h)	
Expected water run-off from drive way in m³/hr (= area of catchment in m² × run-off coefficient × rainfall intensity in m/h)	
Total volume of water conveyed from catchment areas to soak pit in m³.	
Area of the base of the soak pit in m² (= 0.7854 × D × D)	
Absorption ability of soak pit in m³/h (= area of base of soak pit in m² × average level drop from percolation test in m)	
Storage volume of soak pit required (= volume of water conveyed to soak pit – volume of absorption)	
Total volume required for soak pit allowing for rocks (= $\frac{V}{38}$ × 100)	
Required depth of soak pit (= volume of soak pit in m³ ÷ area of base in m²)	

(9 marks) ☐

(b) State TWO sources from which information regarding the average rainfall intensity for a site can be obtained.

1 _____

2 _____

(2 marks) ☐

Total 11 marks ☐

QUESTION 4

A 525 mm stormwater pipe laid at a gradient of 1:40 has a flow velocity of 24 m/s.

The pipe enters a 1050 mm diameter access chamber where it changes direction by 45°.

Using section 5 of New Zealand Building Code Clause E1/VM1, calculate the total fall the pipe will require across the access chamber to maintain the 24 m/s water velocity.

_____

_____

_____

_____

_____

_____

_____

Total 6 marks

QUESTION 5

Answer the following in accordance with AS/NZS 3500.

(a) Give the meaning of the term rising main.

_____

(1 mark)

(b) A rising main is being used to convey stormwater.

Give the test criteria that must be met when proving the main is free from leaks.

_____

_____

_____

_____

(2 marks)

(c) State the TWO permitted locations to which a stormwater rising main is allowed to discharge.

1 _____

2 _____

(2 marks)

Total 5 marks

QUESTION 6

The stormwater drain from a property is lower than the local territorial authority's (TA) main drain connection point.

A pump system cannot be used.

Draw a diagram showing a method of ensuring the stormwater will discharge to the TA drain so that the installation will comply with the New Zealand Building Code E1/AS1 Surface Water. Include all of the requirements that must be met by the installation.

Total 4 marks

QUESTION 7

A carpark has an area of 1200 m². The carpark is in a region where the average rainfall intensity is 50 mm/h.

Calculate how many Type 2 sumps will be required to convey the expected surface water to an appropriate outfall.

_____

_____

_____

_____

Total 2 marks ☐

QUESTION 8

The starter drawing below shows a 100 mm fixture discharge pipe terminating 3 metres above a 100 mm unvented branch drain.

Complete the drawing to show a design solution that will connect the two pipes so that the system complies with the minimum requirements of AS/NZS 3500 Part 2 Sanitary plumbing and drainage.

Include all relevant measurements on your drawing.

100 mm fixture discharge pipe

3 metres

100 mm unvented branch drain

2.5 metres
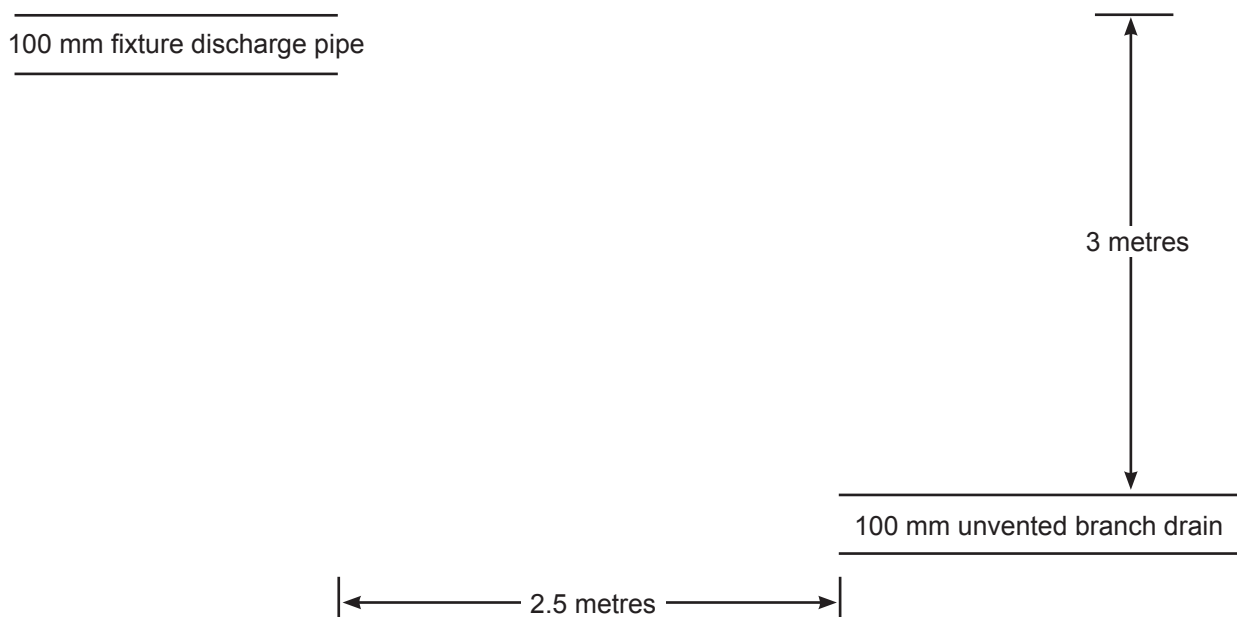
Total 5 marks ☐

QUESTION 9

The diagram opposite shows the design of the foul water drains for a 4 dwelling building drawn to a scale of 1:200.

The invert level at the head of the drains is 500 mm below ground level.

(a)   Show on the diagram the location of any required inspection junctions and inspection bends.

(3 marks)

(b)   Complete the following table to show the quantities of the listed fittings required to complete the installation. The drains are to be installed to comply with the minimum requirements of the New Zealand Building Code Clause G13 Foul Water.

Item	Quantity
Inspection pipes	
Inspection junctions	
Plain junctions	
Plain bends	
Inspection bends	

(4 marks)

Total 7 marks

GT = Gully trap
V = Vent or main drain vent

TA Sewer

Access Chamber

Scale 1:200
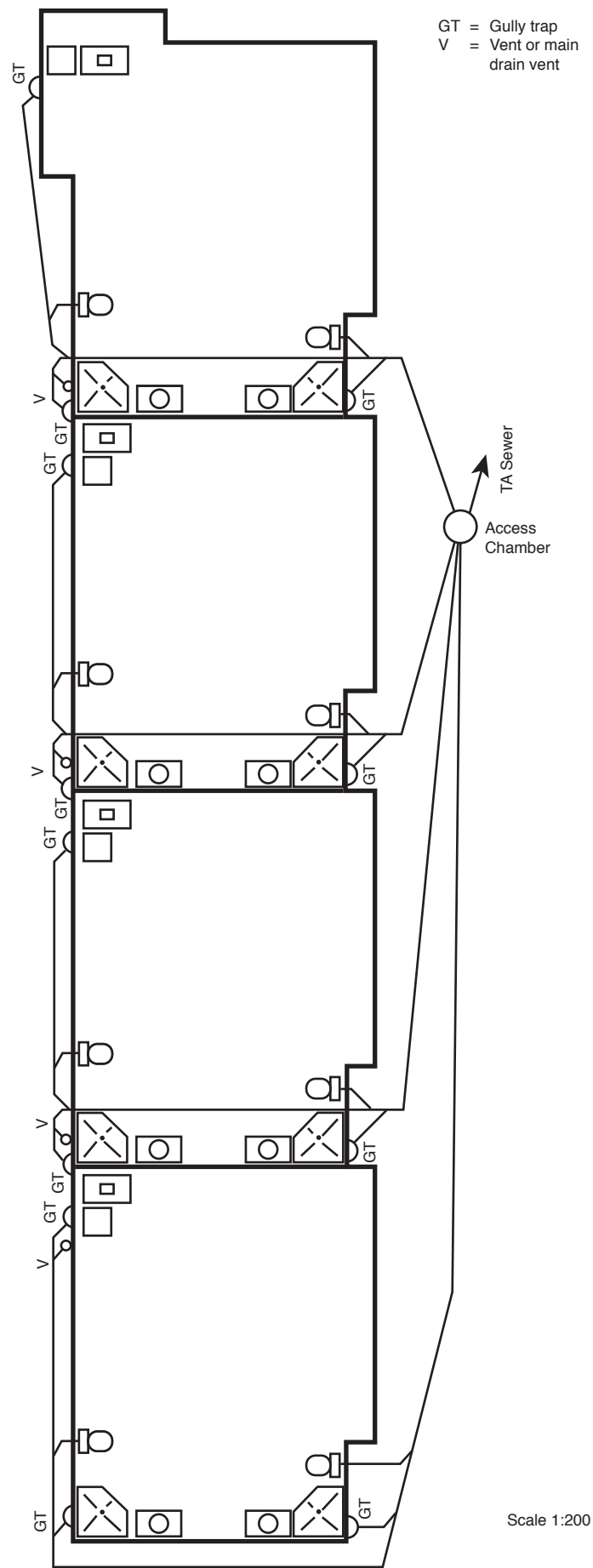
QUESTION 10

Six people are to live in a house served by a single septic tank and trench effluent field system.

The house is supplied with water from a roof-water tank, and it has a waste disposal unit and dishwasher installed in the kitchen.

The Design Loading Rate (DLR) for the soil in the area is 30 mm/day.

The effluent trenches will be 900 mm wide.

Recommended capacities for septic tanks				
Type of Wastewater	Persons		Bedrooms	
	1 to 5	**6 to 10**	**1 to 3**	**4 to 6**
All-waste	3000	4500	3000	4500
Greywater only	1800	2700	1800	2700
Blackwater only	1500	2500	1500	2500

Expected Daily Flow Rate (EDF) in Litres/Person/Day		
Source	On-site Roof Water Tank Supply	Mains or Borehole Water Supply
Households with standard facilities (including automatic washing machine)	140	180
Households with full water reduction fixtures	115	145
Households with extra wastewater producing facilities (waste disposal units, dishwashers, bidets etc)	170	220

(a)   Using the tables above, determine the required capacity for the septic tank.

_____

(1 mark) ☐

QUESTION 10 (cont'd)

(b)   Six people will be living in the house.

Calculate the length of trenching required for the effluent disposal field.

Formula:

$$\text{Length} = \frac{\text{EDF}}{\text{DLR} \times \text{width in metres}}$$

_____

_____

_____

_____

(2 marks) ☐

Total 3 marks ☐

QUESTION 11

The minimum amount of fall required by AS/NZS 3500 Part 2: Sanitary plumbing and drainage is not available for a foul water drain, and so the drain is to be installed at a reduced gradient.

State THREE factors that must be taken into account when designing the drainage system.

1   _____
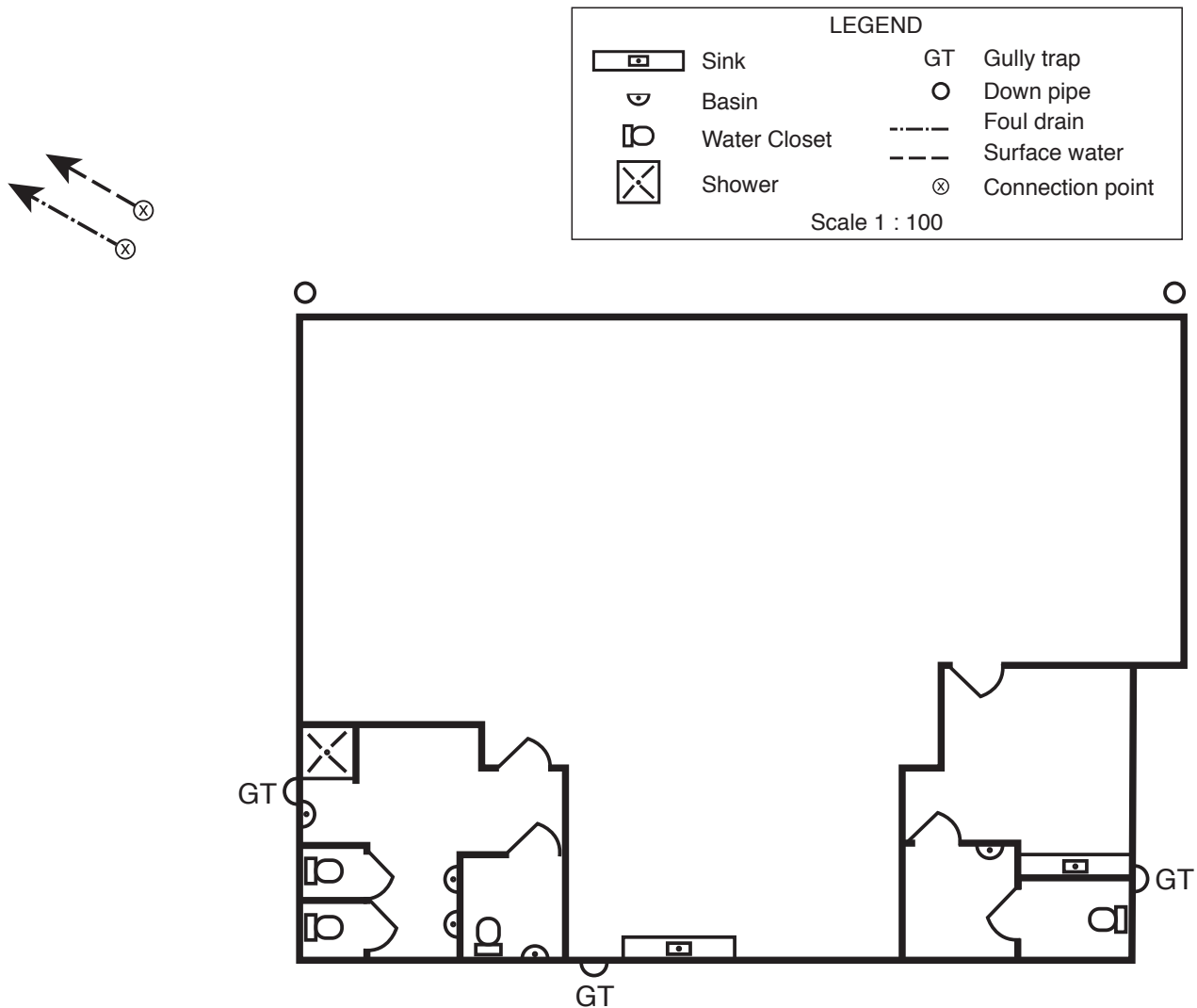
2   _____

3   _____

Total 3 marks ☐

QUESTION 12

(a) The diagram below shows a plan view of the layout of sanitary fixtures in a building drawn to a scale of 1:100. The connection points for the surface water and foul water drain are also shown. On the diagram draw and label a drainage plan that complies with New Zealand Building Code Clauses G13/AS1 Foul Water and E1/AS1 Surface Water.
All drainage is to be exterior to the building.

LEGEND

	Sink	GT	Gully trap
	Basin	O	Down pipe
	Water Closet	–·–·–	Foul drain
	Shower	– – –	Surface water
		⊗	Connection point

Scale 1 : 100

(15 marks)

(b) The invert level at the head of the drain in (a) is 900 mm below the finished floor level and the drain is to be laid at a gradient of 1:50.

Calculate the depth below the finished floor level of the foulwater connection point ⊗.

_____

_____

(3 marks)

Total 18 marks

SECTION B

Answer the following multiple-choice questions by writing your answer (A, B, C, D or E) in the box provided after each one of the questions.

Each correct answer in this section of the examination is worth 1 mark.

Note that should your choice of answer be unclear no marks will be awarded for that question.

1. According to AS/NZS 3500 Part 2: Sanitary plumbing and drainage, which of the following materials is not suitable to convey waste from photographic equipment?

    A   Glass.

    B   uPVC.

    C   Copper.

    D   Vitrified clay.

    E   Stainless steel.

    ☐

2. What is the minimum suction inlet size for a pump used to pump trade waste containing suspended solids that are likely to cause blockage?

    A   40 mm.

    B   50 mm.

    C   80 mm.

    D   100 mm.

    E   150 mm.

    ☐

3. Which of the following pieces of legislation must untreated trade waste discharging to a natural waterway comply with?

    A   The Resource Management Act.

    B   Waste Minimisation Act 2008.

    C   Health (Drinking water) Amendment Act 2007.

    D   Reserves and Other Lands Disposal Act.

    E   New Zealand Public Health and Disability Act 2000.

    ☐

4. A liquid-sealed trap has been installed in a drainage system as the waste contains hazardous gases.

   What is the minimum height the trap vent must extend above ground level?

   A   100 mm.

   B   500 mm.

   C   1000 mm.

   D   2500 mm.

   E   3000 mm.

   ☐

5. Which of the following traps should be installed when conveying trade waste that contains flammable liquid?

   A   Interceptor trap.

   B   Grease trap.

   C   Gully trap.

   D   Liquid-sealed trap.

   E   Bottle trap.

   ☐

6. What is the minimum distance above ground level that trade waste drains can be installed in access areas?

   A   3000 mm.

   B   3500 mm.

   C   4000 mm.

   D   4500 mm.

   E   5000 mm.

   ☐

7. Which New Zealand standard provides an acceptable method for securing a free-standing trade waste storage tank?

   A   NZS 3106

   B   NZS 4219

   C   NZS 5261

   D   NZS 3604

   E   NZS 1711

   ☐

8. When installing storage tanks for corrosive liquid waste, what is the minimum allowable separation distance between the tanks?

A 500 mm.

B 750 mm.

C 1000 mm.

D 1250 mm.

E 1500 mm.

9. Industrial liquid waste must be collected, stored and disposed of in compliance with New Zealand Building Code Clause G14 Industrial Liquid Waste.

Which of the following clauses contains an acceptable solution for the storage facilities if the waste is also hazardous?

A Clause B2.

B Clause E1.

C Clause E2.

D Clause F3.

E Clause G10.

10. Which of the following is true for a drain to be suitable for relining?

A The drain must have no bends.

B The drain must be at least 150 mm in diameter.

C The drain must not be collapsed.

D The drain must be made from earthenware pipe.

E The drain must be fully uncovered.

11. Which of the following cannot be disposed of at a clean fill landfill site?

A Soil.

B Concrete.

C Earthenware pipe.

D Cesspit/stormwater sump cleanings.

E Gravel.

12. In which of the following situations would raking struts be used in an excavation?

A   When the excavation is underground such as a tunnel.

B   When the excavation is very wide and open.

C   When the excavation is too narrow to install horizontal struts.

D   When the excavation is going to extend below the water table level.

E   When the excavation is within 500 mm of the footings of a building.

13. What is the maximum depth for a trench before ladders or stairways must be provided for access?

A   1.0 m.

B   1.2 m.

C   1.5 m.

D   1.8 m.

E   2.0 m.

14. Which of the following pairs of gases are commonly found when excavating reclaimed land or tip fills?

A   Carbon dioxide and steam.

B   Methane and hydrogen sulphide.

C   Carbon dioxide and methane.

D   Carbon dioxide and hydrogen sulphide.

E   Sulphur dioxide and methane.

15. What is the minimum diameter shaft a person should enter so that a rescue can easily performed in the case of an emergency?

A   650 mm.

B   750 mm.

C   850 mm.

D   1050 mm.

E   1200 mm.

Total 15 marks