No. 9198

● Plumbers,
● Gasfitters and
○ Drainlayers Board

REGISTRATION EXAMINATION, NOVEMBER 2015
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 November 2015 were provided with the following documents:
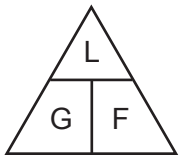
- New Zealand Building Code Clause E1 – Surface Water

- New Zealand Building Code Clause G13 – Foul Water

USEFUL FORMULAE

Circumference of circle = 2 × π × R   or   Circumference of circle = π × D

Area of circle = π × R² or   Area of circle = 0.7854 × D²

Volume of cylinder = π × R² × H   or   Volume of cylinder = 0.7854 × D² × H

length = L
gradient = 1:G
fall = F

SECTION A

QUESTION 1

(a) Give the meaning of the term 'drain' as defined in the Plumbers, Gasfitters and Drainlayers Act.

_____

_____

(1 mark)

(b) Give the meaning of the term 'drain in common'.

_____

_____

(1 mark)

(c) State the actions a drainlayer should take prior to replacing a section of a drain in common.

_____

_____

(1 mark)

Total 3 marks

QUESTION 2

(a)   Give the meaning of the term 'angle of repose' in relation to excavation.

_____

_____

(1 mark) ☐

(b)   Give THREE factors that affect on the angle of repose.

1   _____

2   _____

3   _____

(3 marks) ☐

(c)   Trench collapse is a hazard when working in an excavation.

Give THREE other hazards that may be present when working in an excavation.

1   _____

2   _____

3   _____

(3 marks) ☐

(d)   Give FOUR actions that could be taken to reduce the risk of an accident when working in an excavation.

1   _____

2   _____

3   _____

4   _____

(4 marks) ☐

QUESTION 2 (cont'd)

(e)   Give TWO conditions under which an excavation becomes notifiable work.

1 _____

2 _____

(2 marks)

(f)   Personal protection equipment has been supplied to a worker for a particular task.

Give the circumstances under which the employee can choose not to wear the equipment provided.

_____

(1 mark)

(g)   A certifying drainlayer is to instruct a trainee how to use a piece of machinery.

Give FOUR matters regarding safety that should be covered in the training.

1 _____

2 _____

3 _____

4 _____

(4 marks)

Total 18 marks

QUESTION 3

(a) Name TWO devices used to provide oxygen to aerobic bacteria within an aerated waste water system, and briefly explain how each device works.

1 _____

_____

2 _____

_____

(4 marks) ☐

(b) Give THREE advantages of installing an aerated sewage treatment system compared with a traditional septic tank installation.

1 _____

2 _____

3 _____

(3 marks) ☐

(c) Give FOUR disadvantages an aerated sewage treatment system has compared with a traditional septic tank installation.

1 _____

2 _____

3 _____

4 _____

(4 marks) ☐

Total 11 marks ☐

QUESTION 4

Give the FOUR provisions that must be met in the construction of an on-site sewage treatment plant for it to comply with New Zealand Building Code clause G13 Foul Water.

1 _____

_____

2 _____

_____

3 _____

_____

4 _____

_____

Total 2 marks

QUESTION 5

The plan opposite shows a building and contour lines on a site. The foul water drainage pipework connecting the dwelling to the network utility operator's (NUO) sewer is also shown.

(a) The pipework has been laid at a gradient of 1:60, and the distances between the points are as shown in the table below.

Complete the table below to show the correspondent falls in millimetres.

| Length of pipe sections		
Pipe section	Distance	Fall in mm
A – B	5.6 metres	
B – C	7.5 metres	
C – D	9.0 metres	
B – F	6.9 metres	
C – E	1.6 metres	

(b) The invert for the NUO connection marked A is 1.15 m below ground level.

Complete the table below to show the depth in millimetres below ground level to the invert of the drain at the points A – F.

Depth of invert of drain	
Point	Depth in mm
A	
B	
C	
D	
E	
F	

Total 10 marks

2.400 m

NUO Sewer

2.450 m

2.550 m

2.500 m

C

B

A

D

2.550 m

E

Ensuite

Bath

Kitchen

F
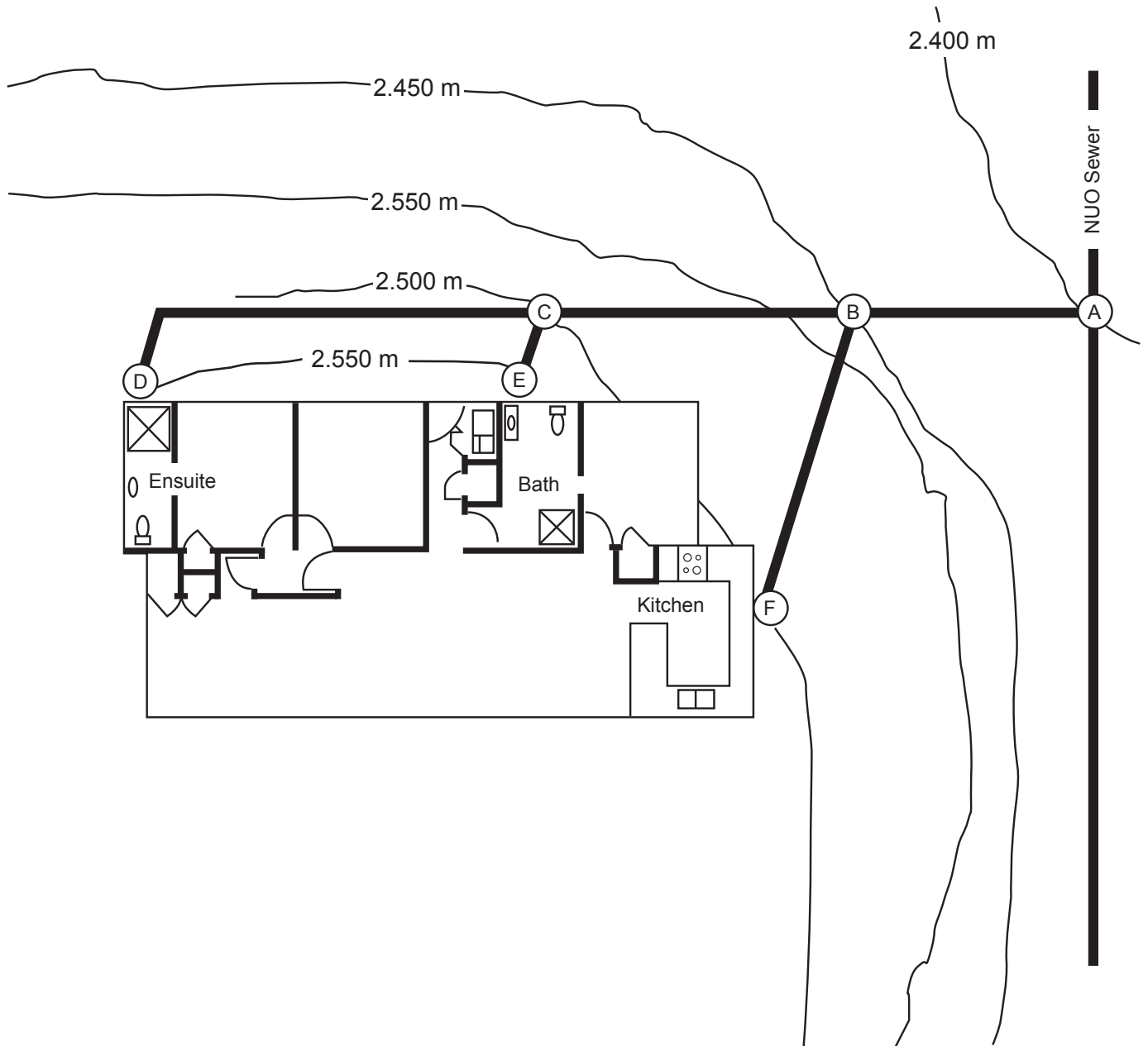
QUESTION 6

The starter drawing below shows the proposed footprint of an addition to an existing building with a concrete pad. The addition is to be built over an existing drain, as shown.

(a) (i) Complete the drawing to show the modifications that must be made to the drain to ensure it complies with New Zealand Building Code clause G13 Foul Water.
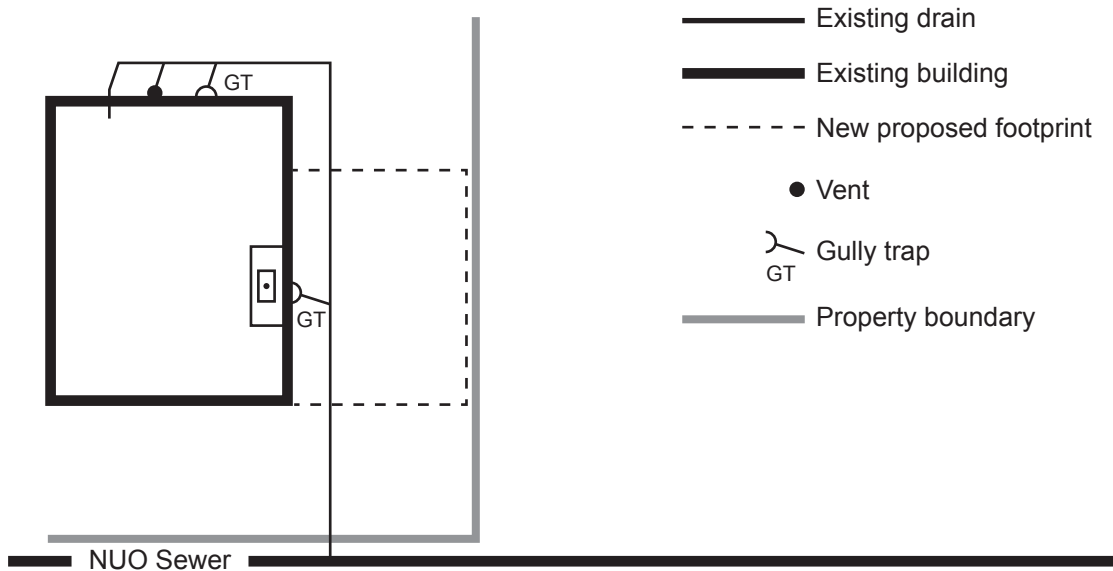
(3 marks)

(ii) State the type of pipe material that will be required in the modification above.

_____

(1 mark)

(b) State the minimum amount of clearance space that must be provided between the external wall footing and the top of the drain.

_____

(1 mark)

Total 5 marks

QUESTION 7

(a) A trade waste disposal system has been designed to comply with the Building Act.

Name the other Act of Parliament that also must be complied with if the waste is to discharge to a natural water course.

_____

(1 mark)

(b) Name the type of trap that must be used when collecting trade waste that contains a flammable liquid.

_____

(1 mark)

(c) Give the meaning of each of the following terms as they relate to drainlaying.

(i) Prohibited trade waste.

_____

(1 mark)

(ii) Conditionally acceptable trade waste.

_____

(1 mark)

(iii) Acceptable trade waste.

_____

(1 mark)

Total 5 marks

QUESTION 8

The plan below shows the layout of sanitary fixtures for a new dwelling and a connection point (marked A) to the network utility operator (NUO) sewer. The plan has been drawn at a scale of 1:100.

Complete the diagram to show the foul water drainage system required to convey waste to the NUO sewer connection point. The completed system is to comply with the minimum requirements of New Zealand Building Code Clause G13/AS2 Foul Water.
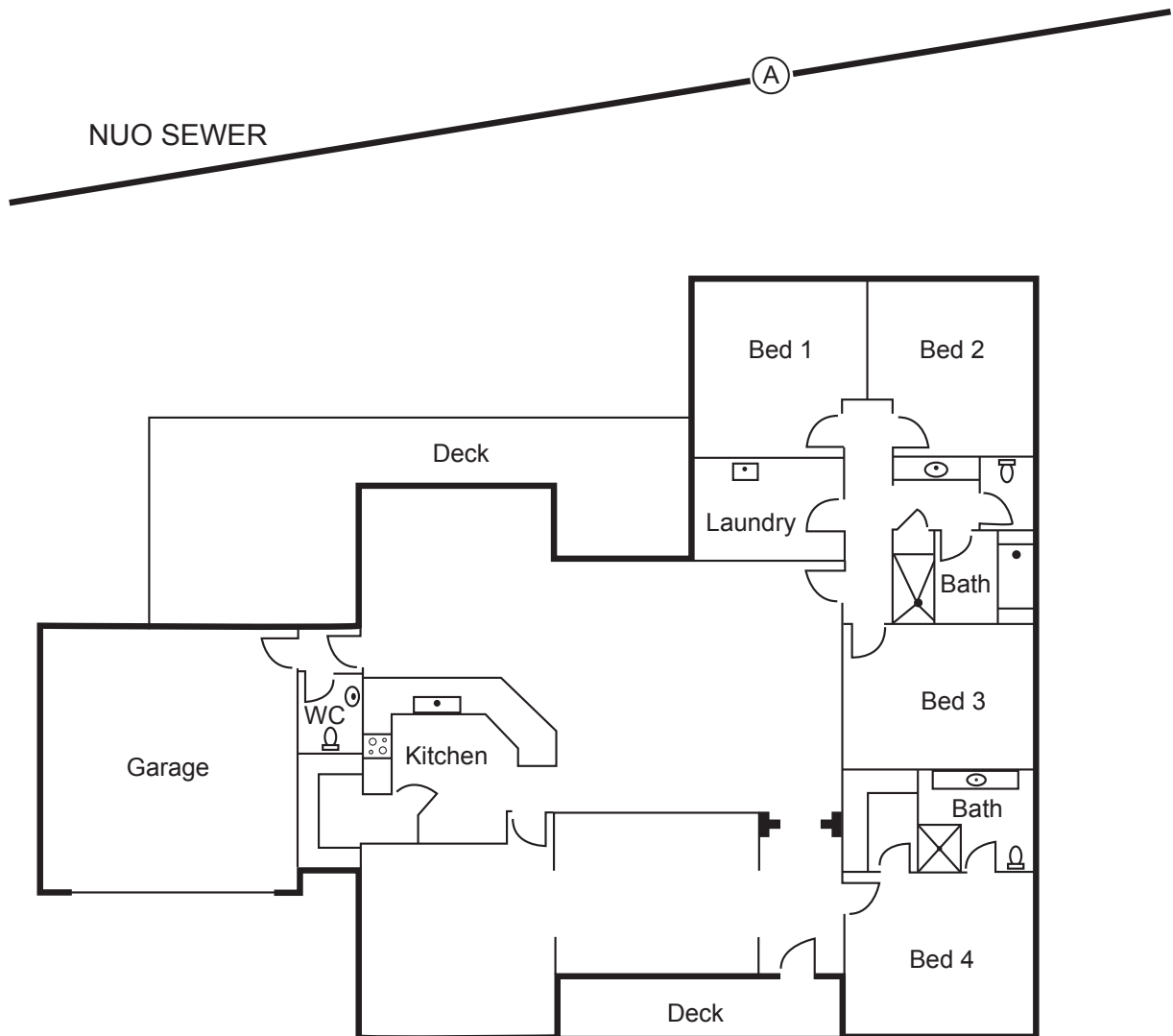
Total 10 marks

QUESTION 9

A surface water drain is to be laid in a manner to prevent scouring where it discharges into a stream.

(a)   Give TWO ways in which the likelihood of scouring can be reduced.

1   _____

2   _____

(2 marks)

(b)   Name THREE structures that may be used to protect the stream from scouring.
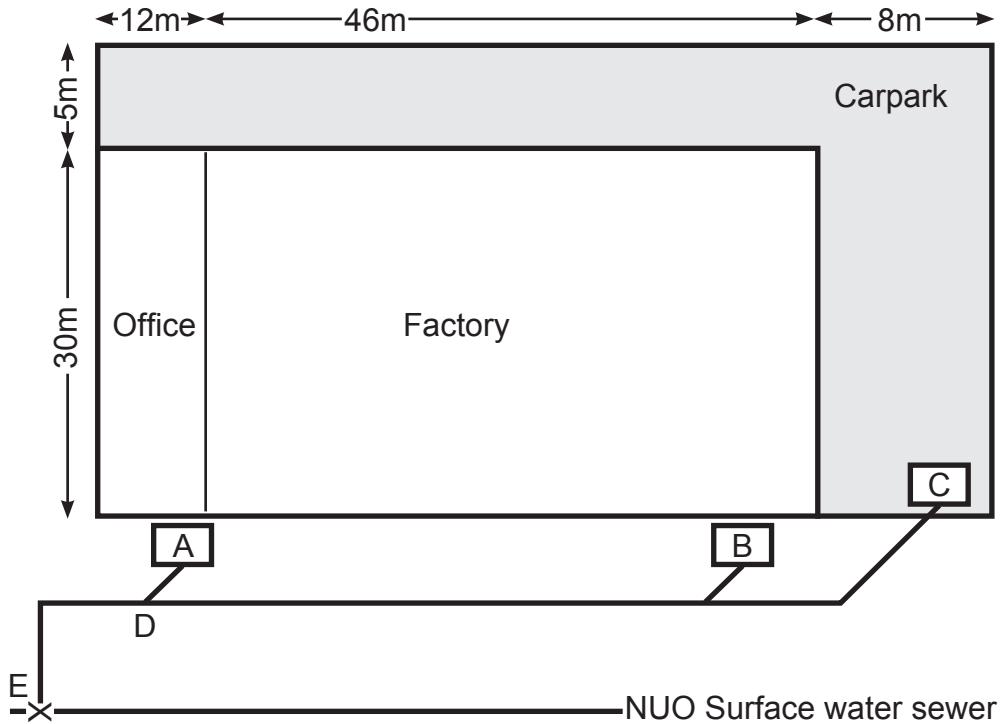
1   _____

2   _____

3   _____

(3 marks)

Total 5 marks

QUESTION 10

The diagram below shows a factory and office with a sealed carpark.

The surface water from the roof drains to the downpipes labelled A and B. The driveway and carpark drain into the sump labelled C.

(a) The installation has been designed for a rainfall intensity of 63 mm/h.

Calculate the modified catchment area for each of the factory, the office and the carpark.

Formula: Modified catchment area = 0.01 × area x Rainfall intensity

The installation is to comply with the minimum requirements of the New Zealand Building Code clause E1/AS1 Surface Water.

Office:

_____

Factory:

_____

Carpark:

_____

(3 marks)

QUESTION 10 (cont'd)

(b) Determine the minimum size of the branch drain that is required to convey surface water from each of the points A, B and C.

A _____

B _____

C _____

(3 marks)

(c) Determine the size of the main drain D – E required to convey surface water to the NUO sewer.

_____

(1 mark)

(d) Determine what type of sump is required to be installed at point C.
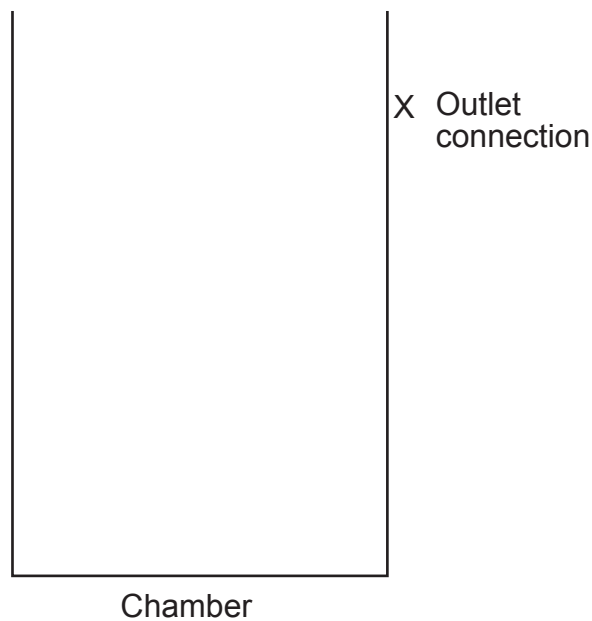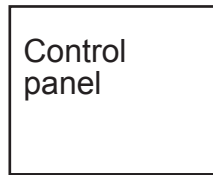
_____

_____

(1 mark)

Total 8 marks

QUESTION 11

Describe the safety procedures that should be carried out when conducting a high pressure test on a 600 mm diameter drain.

_____

_____

_____

Total 2 marks

QUESTION 12

(a)   Complete the starter drawing to show the installation of a wet well duplex surface water pumping system and label the required parts.

Control panel

X Outlet connection

Chamber

(8 marks)

(b)   Explain, in sequence, what should occur as the water level rises within the chamber in a situation where the pumping mechanisms are not functioning.

_____

_____

_____

_____

_____

(3 marks)

Total 11 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.

Should your choice of answer be unclear no mark will be awarded.

1   A registered drainlayer has changed address.

Within which time frame must the drainlayer notify the Plumbers, Gasfitters and Drainlayers Board?

A   1 week.

B   3 weeks.

C   1 month.

D   3 months.

E   6 months.

2   A surface water system must be designed to cope with the expected rainfall in a 10 minute period of a storm that occurs how often?

A   Every 10 years.

B   Every 15 years.

C   Every 20 years.

D   Every 25 years.

E   Every 30 years.

3.   What is the minimum allowable gradient for a 225 mm surface water drain?

A   1:90

B   1:120

C   1:250

D   1:300

E   1:350

4.   A water test of a surface water drain is to be carried out to comply with New Zealand Building Code clause E1/VM1 Surface Water.

What is the required length of time for the test?

A   15 minutes.

B   30 minutes.

C   4 hours.

D   12 hours.

E   24 hours.

5.   Type One sumps are to be installed to comply with New Zealand Building Code Clause E1/AS1 Surface Water. The 10% AEP of a site is 25 mm.

What is the maximum area permitted to be draining into each sump installed on the site.

A   180 m².

B   450 m².

C   1800 m².

D   4340 m².

E   4500 m².

6.   Which of the following is not a required location for an access point on a surface water drain, as specified by New Zealand Building Code clause E1/AS1 Surface Water?

A   At least every 50 m where rodding points are used.

B   At least every 100 m where inspection points, inspection chambers or access chambers are used.

C   Changes in direction of greater than 45°.

D   Changes in gradient of greater than 45°.

E   Junctions of drains serving a single downpipe, that are less than 2.0 m long.

7. A rectangular chamber must provide 9 m³ of storage volume. The available area to construct the chamber measures 2.4 m × 2.8 m.

    What minimum depth will the chamber need to have?

    A   1.34 m.

    B   1.73 m.

    C   3.21 m.

    D   3.75 m.

    E   3.80 m.

8. What is the corrected run-off coefficient for a sealed driveway that has a slope of 15%?

    A   0.70

    B   0.75

    C   0.80

    D   0.85

    E   0.90

9. What is the maximum permitted length of an unvented branch drain connected to a sullage dump point at a caravan park?

    A   1.5 m.

    B   3 m.

    C   6 m.

    D   8 m.

    E   10 m.

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.

Total 10 marks