No. 9195

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◗ Plumbers,
◗ Gasfitters and
○ Drainlayers Board

REGISTRATION EXAMINATION, NOVEMBER 2013
CERTIFYING PLUMBER

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 20–21 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
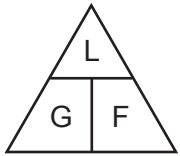
Candidates that sat this examination in November 2013 were provided with the following documents:

- New Zealand Building Code Clause G1 Personal Hygiene

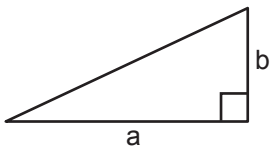- AS/NZS 3500 Part 2: Sanitary plumbing and drainage

USEFUL FORMULAE

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

Area of circle = π × R^2 or   Area of circle = 0.7854 × D^2

length = L
gradient = 1:G
fall = F

Volume of cylinder = π × R^2 × H   or   Volume of cylinder = 0.7854 × D^2 × H

$a^2 + b^2 = c^2$

Heat energy = mass × specific heat × temp diff

Litres of hot water × temp diff cold to hot = litres of mixed water × temp diff cold to mixed

Heating time = $\dfrac{\text{mass of water (kg)} \times 4.2 \times \text{temp diff (}^o\text{C)} \times 100}{\text{heat energy input per hour in kJ} \times \text{efficiency (\%)}}$

Box's formula: q = $\sqrt{\dfrac{H \times D^5}{25 \times L \times 10^5}}$

where   q = quantity discharged in litres per second
H = head in metres
D = diameter of pipe in mm
L = length of pipe in metres

SECTION A

QUESTION 1

(a) A local regional council requires that a dwelling stores two days' supply of water at 125 litres per person per day, for use during maintenance and emergencies. The dwelling is to house six people.

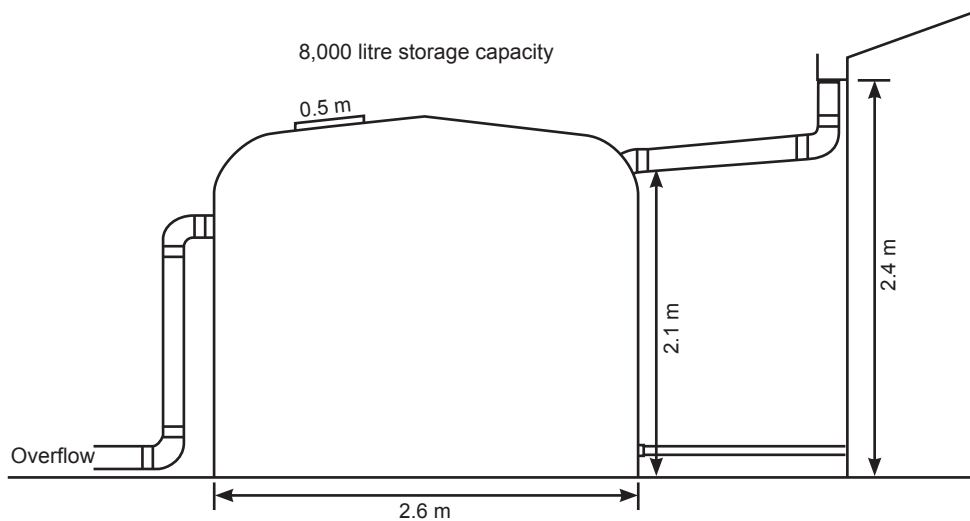Calculate the minimum required storage capacity for the water tank.

_____

_____

_____

(1 mark)

(b) The drawing below shows a water tank installed on a site.

Calculate the minimum height the overflow pipe can be installed at so that an 8,000 litre capacity is maintained.

8,000 litre storage capacity

0.5 m

2.1 m

2.4 m

Overflow

2.6 m

_____

_____

_____

_____

_____

_____

(4 marks)

Total 5 marks

QUESTION 2

The drawing on the page opposite shows part of a fully-vented modified stack system which is to be offset by 3 metres and extended to serve additional fixtures on levels 5, 6 and 7. When fully completed, the stack will carry a total of 78 discharge units, and the developed length of the vents will be 24 metres.

The customer has requested that a floor waste gully be added on level 5 for wash down purposes.
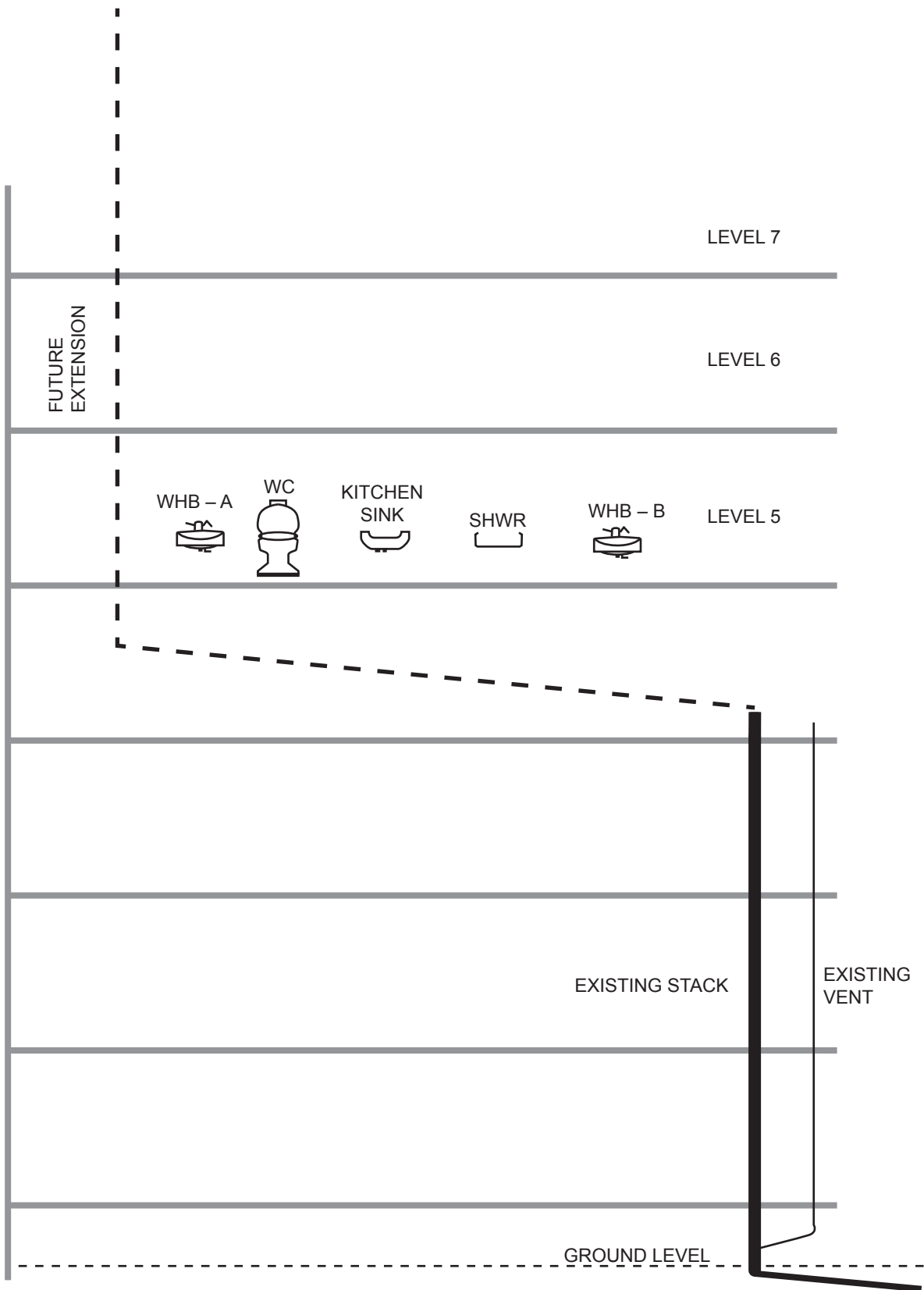
(a)   Complete the drawing to connect the fixtures from level 5 only to the stack so that it will comply with the minimum requirements of AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

(2 marks)

(b)   On the drawing, show all venting requirements.

(4 marks)

(c)   Complete the table below to show the minimum allowable diameter for each part listed for the system drawn in (a).

Wash hand basin A outlet	
Wash hand basin A trap	
Wash hand basin A fixture discharge pipe	
Shower outlet	
Shower trap	
Shower fixture discharge pipe	
Sink outlet	
Sink trap	
Sink fixture discharge pipe	
WC pan outlet	
WC pan fixture discharge pipe	
Wash hand basin B outlet	
Wash hand basin B trap	
Wash hand basin B fixture discharge pipe	
Floor waste gully outlet	

(6 marks)

Total 12 marks

FUTURE EXTENSION

LEVEL 7

LEVEL 6

WHB – A   WC   KITCHEN SINK   SHWR   WHB – B   LEVEL 5

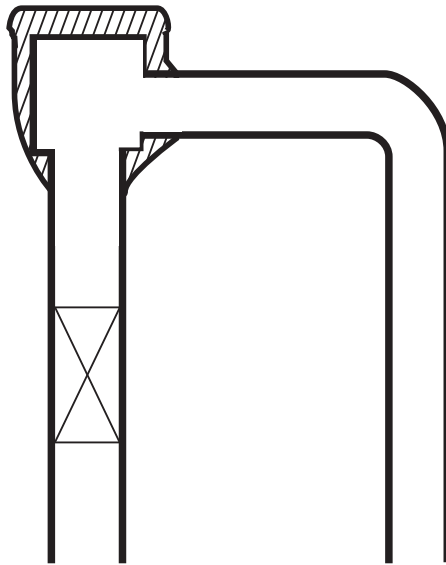EXISTING STACK

EXISTING VENT

GROUND LEVEL

QUESTION 3

(a) The diagram below shows a cross-section of the body of an atmospheric vacuum breaker backflow prevention device.

    (i)   Complete the drawing to show the internal components of the valve.

                                              (1 mark)

    (ii)   Name the type of backflow this device can provide protection against.

_____

                                              (1 mark)

    (iii) Describe a situation that would cause this device to activate.

_____

_____

                                              (1 mark)

(b) Explain how an atmospheric vacuum breaker backflow prevention device operates.

_____

_____

_____

_____
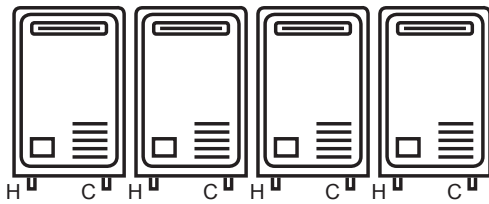
                                              (3 marks)

Total 6 marks

QUESTION 4

The hot water in a building is supplied from a storage water cylinder heated by a bank of four continuous-flow water heaters.

Complete the starter drawing below show the completed pipework for the system. Include in your drawing all the necessary valves and components to make the installation safe and functional.

HOT FLOW
TO FIXTURES

H C H C H C H C

HWC

COLD WATER MAIN
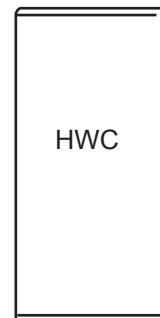
Total 8 marks

QUESTION 5

The plan on the page opposite shows the layout of sanitary fixtures for a proposed dwelling. The diagram is drawn to a scale of 1:100

The dwelling is to be built on a concrete pad foundation.

The drainage design for the dwelling has been completed, and the connection point for the sanitary plumbing is as shown on the plan.

The sanitary plumbing system is to comply with the minimum requirements of AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

(a)   Draw on the plan the location of all discharge pipes and vents.

(b)   Show on the plan the minimum allowable diameter for each section of discharge and vent pipework.

Total 9 marks
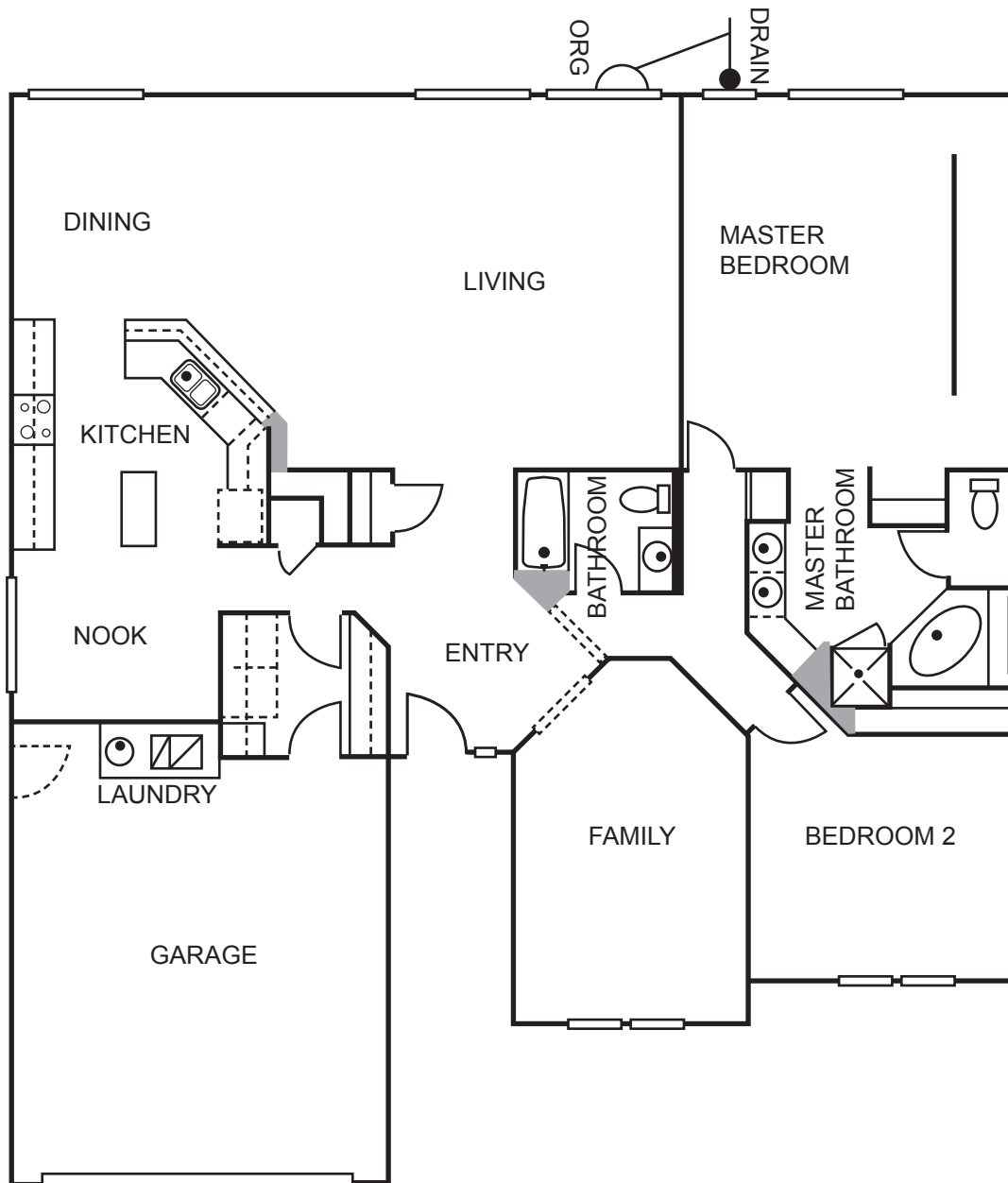
Scale 1:100

QUESTION 6

The diagram below shows a 20 metre deep bore supplying water for a dwelling.

Three possible locations for a pump are indicated by A, B and C.
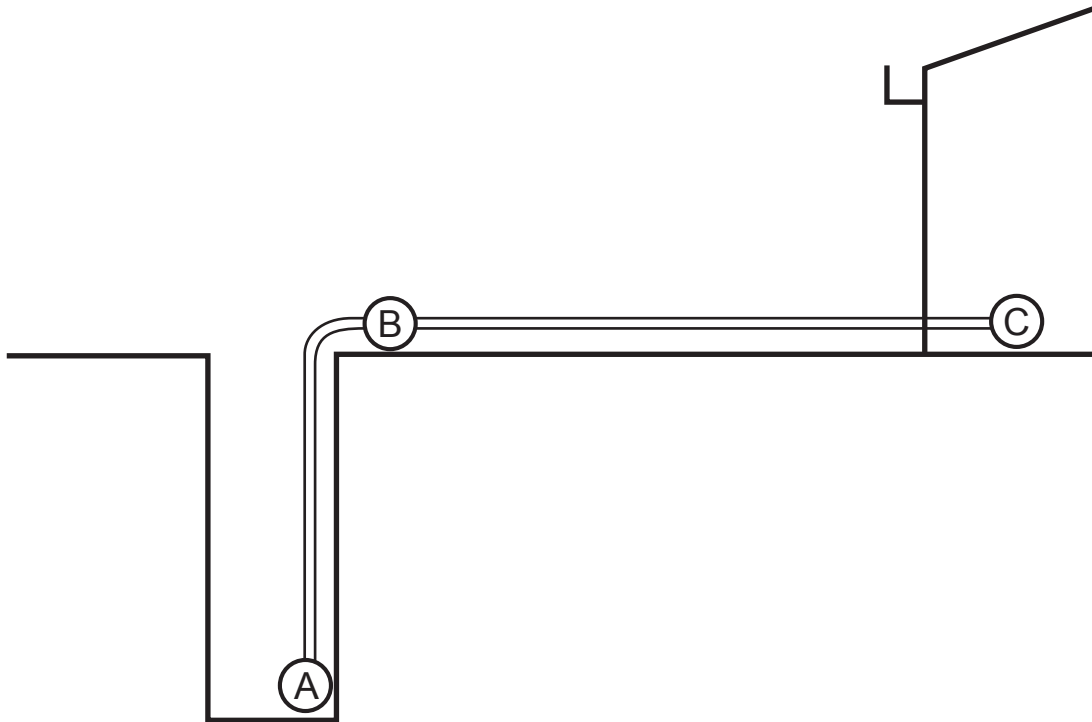
Complete the table below by naming a suitable pump for each location, and giving an advantage and a disadvantage for installing that pump at that location. Name a different pump for each location.

Location	Pump Type	Advantage	Disadvantage
A			
B			
C			

Total 9 marks

QUESTION 7

(a)   Give the conditions under which a method to prevent grease entering a drainage system
must be installed according to the New Zealand Building Code Clause G13 Foul Water.

_____

_____

(1 mark)

(b)   Describe how a grease convertor operates.

_____

_____

(2 marks)

(c)   Give an advantage a grease convertor has compared with a grease trap.

_____

_____

_____

(1 mark)

(d)   Give a disadvantage a grease convertor has compared with a grease trap.

_____

(1 mark)

Total 5 marks

QUESTION 8

(a) Describe a situation that would require an expansion joint to be installed on a sanitary plumbing discharge stack.

_____

_____

(1 mark) ☐

(b) Sketch a cross-section of an expansion joint on a sanitary plumbing waste system jointing two sections of a vertical stack.

(2 marks) ☐

Total 3 marks ☐

QUESTION 9

The starter drawing below shows four 12-storey discharge stacks connected to a drain.

Each individual stack is to be fitted with an 80 mm diameter relief vent, and there is to be only one penetration through the roof.

The venting system is to comply with the minimum requirements of AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

Complete the drawing to show the venting system, and show the diameters of all vent pipework.
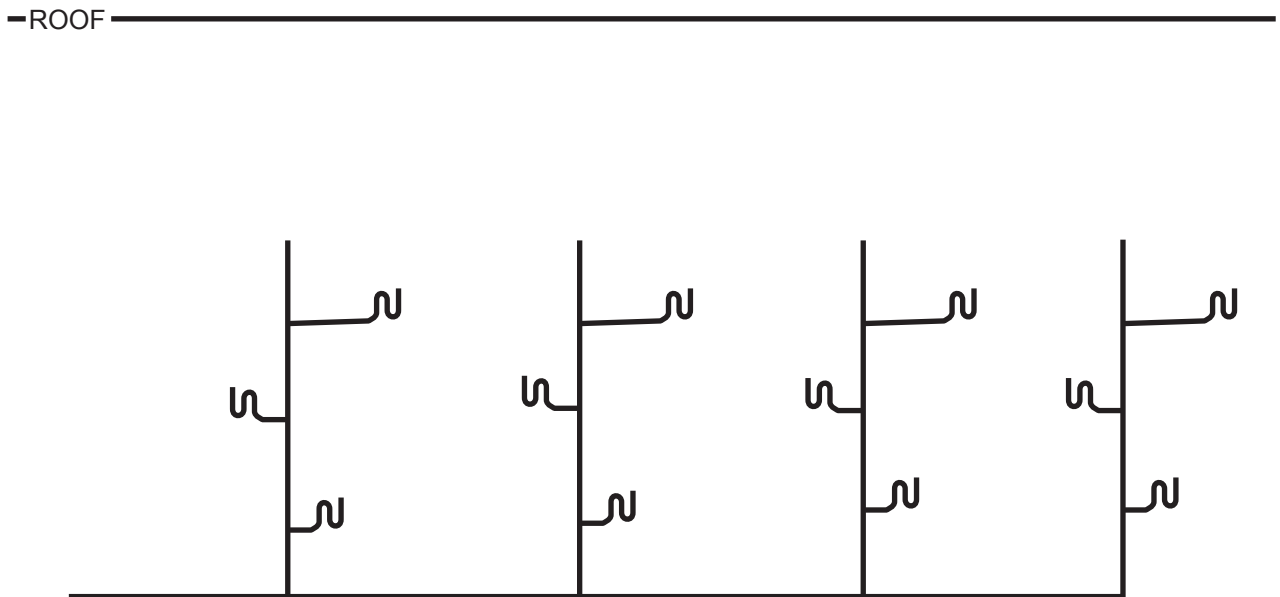
Total 6 marks

QUESTION 10

(a) Give TWO methods, other than insulation, for protecting a solar collector water heating system from damage due to frost.

1 _____

2 _____

(2 marks)

(b) Sketch a cross-sectional diagram of an evacuated tube as used in an indirect solar heating collector.

(4 marks)

QUESTION 10 (cont'd)

(c)   Give FIVE requirements that must be met when installing an uncontrolled heat source.

1 _____

2 _____

3 _____

4 _____

5 _____

(5 marks)

(d)   Give an advantage an evacuated tube solar collector has compared with a flat plate collector.

_____

_____

(1 mark)

Total 12 marks

QUESTION 11

(a) Minutes are taken for a safety meeting on a construction site.

List FIVE items of information that should be recorded in the minutes.

1 _____

2 _____

3 _____

4 _____

5 _____

(5 marks)

(b) An accident report must be completed for all accidents that occur on a work site.

List FIVE items of information that should be recorded in the accident report.

1 _____

2 _____

3 _____

4 _____

5 _____

(5 marks)

Total 10 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 in this section of the examination no marks will be awarded for that question.

1.   When designing a layout of the piping for an accessible toilet compartment, what is the minimum allowable distance from the edge of the hand basin to the front rim of the WC pan?

   A   200 mm.

   B   230 mm.

   C   300 mm.

   D   400 mm.

   E   550 mm.

2.   When installing an accessible basin, what height should the top of the basin be from the floor?

   A   675 mm.

   B   900 mm.

   C   1000 mm.

   D   Between 900 mm and 1200 mm.

   E   Between 800 mm and 850 mm.

3.   The sanitary plumbing requirements for an industrial building are being determined.

   Under what circumstances must accessible facilities be provided?

   A   When the building has two or more levels.

   B   All industrial buildings must provide accessible facilities.

   C   When a process carried out in the building may require employees to shower on site.

   D   When there are more than 10 employees working in the building.

   E   When customers are likely to enter the building.

4. What is the minimum pressure required for a hydrostatic test on cold water pipework?

A 100 kPa.

B 500 kPa.

C 750 kPa.

D 1000 kPa.

E 1500 kPa.

☐

5. Cold water pipework is being installed above the ground to comply with AS/NZS 3500.

What is the minimum allowable separation between the pipework and any electrical wire or cable?

A 25 mm.

B 50 mm.

C 75 mm.

D 100 mm.

E 150 mm.

☐

6. How many millimetres of compacted sand must be provided surrounding a water supply pipe installed under the ground to comply with AS/NZS 3500?

A 25

B 50

C 75

D 100

E 150

☐

7. What colour indicates a non-potable water supply as specified in AS/NZS 3500?

A Black.

B Purple.

C Orange.

D Green.

E Red.

☐

8. How many millimetres wall length for a continuous wall type urinal is equivalent to one urinal stall?

   A   400

   B   500

   C   600

   D   700

   E   800

   ☐

9. According to New Zealand Building Code G1 Personal Hygiene, what is the maximum height above floor level the operating control of a manual urinal flushing device is permitted to be located?

   A   1.0 m.

   B   1.1 m.

   C   1.2 m.

   D   1.3 m.

   E   1.4 m.

   ☐

10. Separate toilet facilities for males and females are to be provided in a factory.

    What is the multiplication factor required to calculate how many of the occupants are likely to be female and helps determine the number of facilities that must be provided?

    A   0.50

    B   0.60

    C   0.65

    D   0.70

    E   0.80

    ☐

11. According to the Building Act 2004, which of the following modifications requires a building consent?

   A   Adding a split heat pump water heater to an existing hot water storage heater.

   B   Replacing a low pressure valve-vented electric hot water cylinder with a low pressure valve-vented gas hot water cylinder.

   C   Replacing a WC pan and cistern with a close-coupled WC suite.

   D   Replacing the flue on an existing solid fuel heater.

   E   Replacing an open-vented hot water cylinder with a valve-vented hot water cylinder in the same position.

12. What is the function of an automatic air valve in a plumbing system?

   A   To allow air to escape a water pipe system when filling the system with water.

   B   To allow air into a water main system to prevent siphonage.

   C   To allow air to enter a foul water system to dry any sludge lining the pipe work.

   D   To allow air to escape a foul water system to prevent trap seal loss.

   E   To allow air to automatically enter a building for ventilation.

13. When is a dry riser main installed for fire fighting purposes?

   A   When the building contains high volumes of electrical equipment.

   B   When the water supply is metered.

   C   When the riser main is installed in an area subject to vandalism.

   D   When the riser main is installed in an area susceptible to freezing.

   E   When the riser main is over 55 metres high.

14. An 8 metre length of pipe has been installed at a gradient of 1:80 (1.25%).

What is the pipe fall?

A   8 mm.

B   10 mm.

C   80 mm.

D   100 mm.

E   1,000 mm.

15. A pipe is to be laid at a gradient of 2.5%. The fall is 1350 mm.

What is the length of the pipe?

A   5.4 m

B   11.4 m

C   14 m

D   54 m

E   140 m

Total 15 marks

For Examiner's use only

Question number	Marks	Marks
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
Section B		
Total		