

Affix label with Candidate Code
Number here.
If no label, enter candidate
Number if known

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No. 9195



Plumbers,
Gasfitters and
Drainlayers Board

REGISTRATION EXAMINATION, NOVEMBER 2015

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 21–25 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 25 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

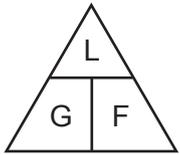
Candidates that sat this examination in November 2015 were provided with the following documents:

- New Zealand Building Code Clause G12 – Water Supplies
- New Zealand Building Code Clause G13 – Foul Water
- AS/NZS 3500 Part 2: Sanitary plumbing and drainage

USEFUL FORMULAE

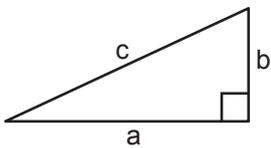
Circumference of circle = $2 \times \pi \times R$ or Circumference of circle = $\pi \times D$

Area of circle = $\pi \times R^2$ or Area of circle = $0.7854 \times D^2$



length = L
gradient = 1:G
fall = F

Volume of cylinder = $\pi \times R^2 \times H$ or Volume of cylinder = $0.7854 \times D^2 \times H$



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

Heat energy = mass \times specific heat \times temp diff

Litres of hot water \times temp diff cold to hot = litres of mixed water \times temp diff cold to mixed

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

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

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

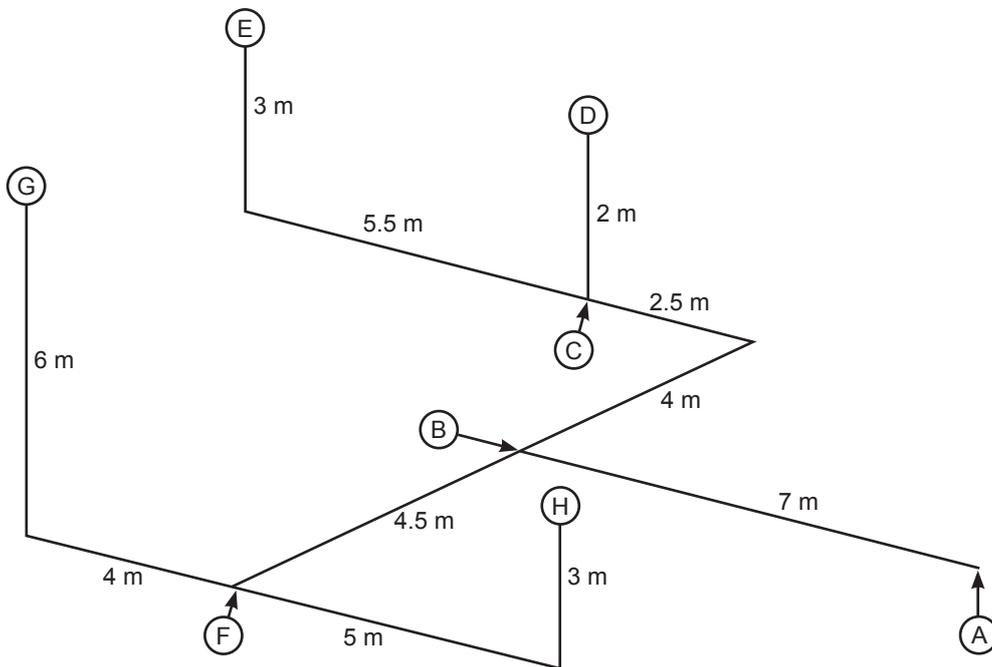
SECTION A

QUESTION 1

The diagram below shows a schematic of polybutylene hot water supply pipework in a building.

The building specifications state:

- Support is to be provided 100 mm from the end of each pipe.
- Three clips are to be included for each tee, each located 100 mm from the tee.
- Two clips are to be included for each bend, each located 100 mm from the bend.
- The straight lengths of pipework are to be supported to comply with New Zealand Building code clause G12/AS1 Water Supplies.



Complete the table below to show the number of clips required for each listed section of the pipework. The diameter of the pipework in each section is as shown.

Pipe section	Number of clips
A – B (20 mm)	
B – C (20 mm)	
C – D (15 mm)	
C – E (15 mm)	
B – F (20 mm)	
F – G (15 mm)	
F – H (15 mm)	

Total 7 marks

QUESTION 2

(a) Give FOUR categories of people who must be protected from injury on a worksite.

- 1 _____
- 2 _____
- 3 _____
- 4 _____

(4 marks)

(b) Give the FOUR pieces of information that an employer must provide to an employee regarding health and safety before commencing work.

- 1 _____
- 2 _____
- 3 _____
- 4 _____

(4 marks)

(c) State the condition provided by the Health and Safety in Employment Act in which an employee may be permitted to refuse to do work.

(1 mark)

(d) A workplace hazard has been identified, and it is not practicable to eliminate or isolate the hazard.

State TWO actions an employer must take in this situation.

- 1 _____
- 2 _____

(2 marks)

QUESTION 2 (cont'd)

(e) Complete the table below to show which of the following situations are notifiable work and which are not.

	Notifiable work Yes/No
Work on the roof of a 2-storey residential building that is 6 metres high	
Lifting a 600 kg water tank into place with a block and tackle	
Work in a trench that is 1.2 metres deep	
Clipping pipework installed within a duct underground.	
Removing a hot water cylinder that has been installed on a base that contains asbestos	
Installing an emergency shower in an area where explosives are stored	

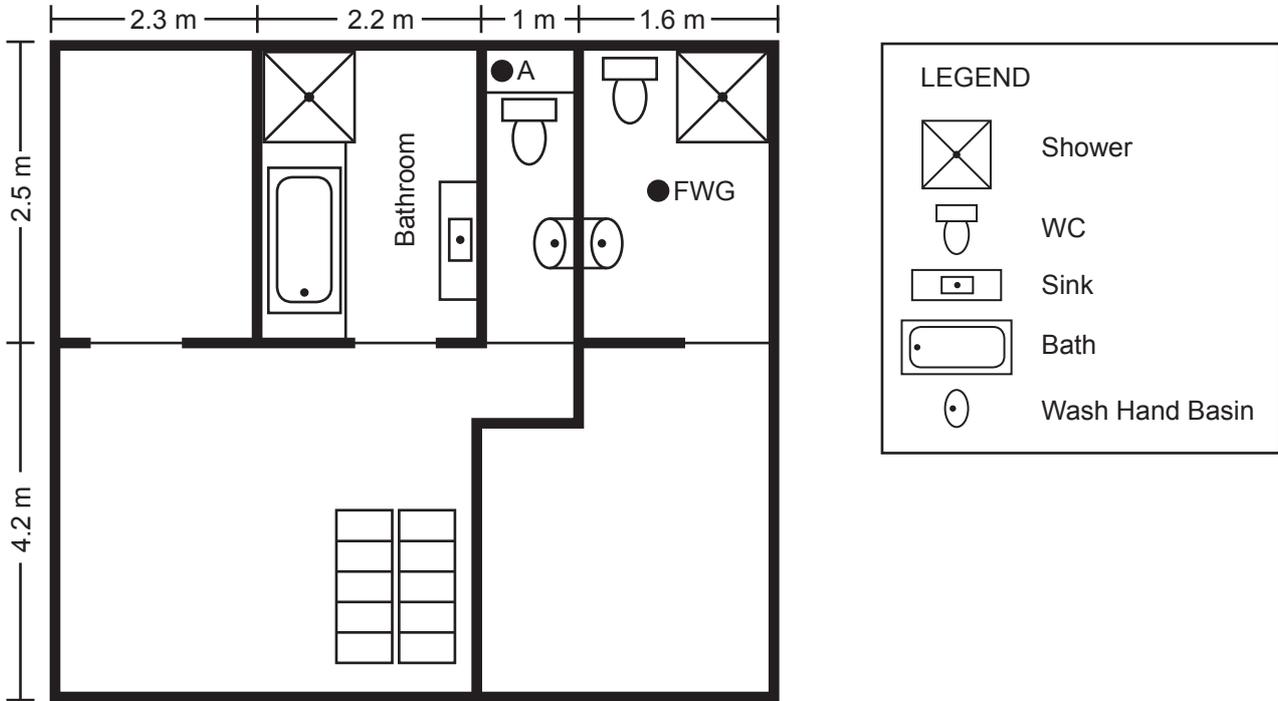
(6 marks)

Total 17 marks

QUESTION 3

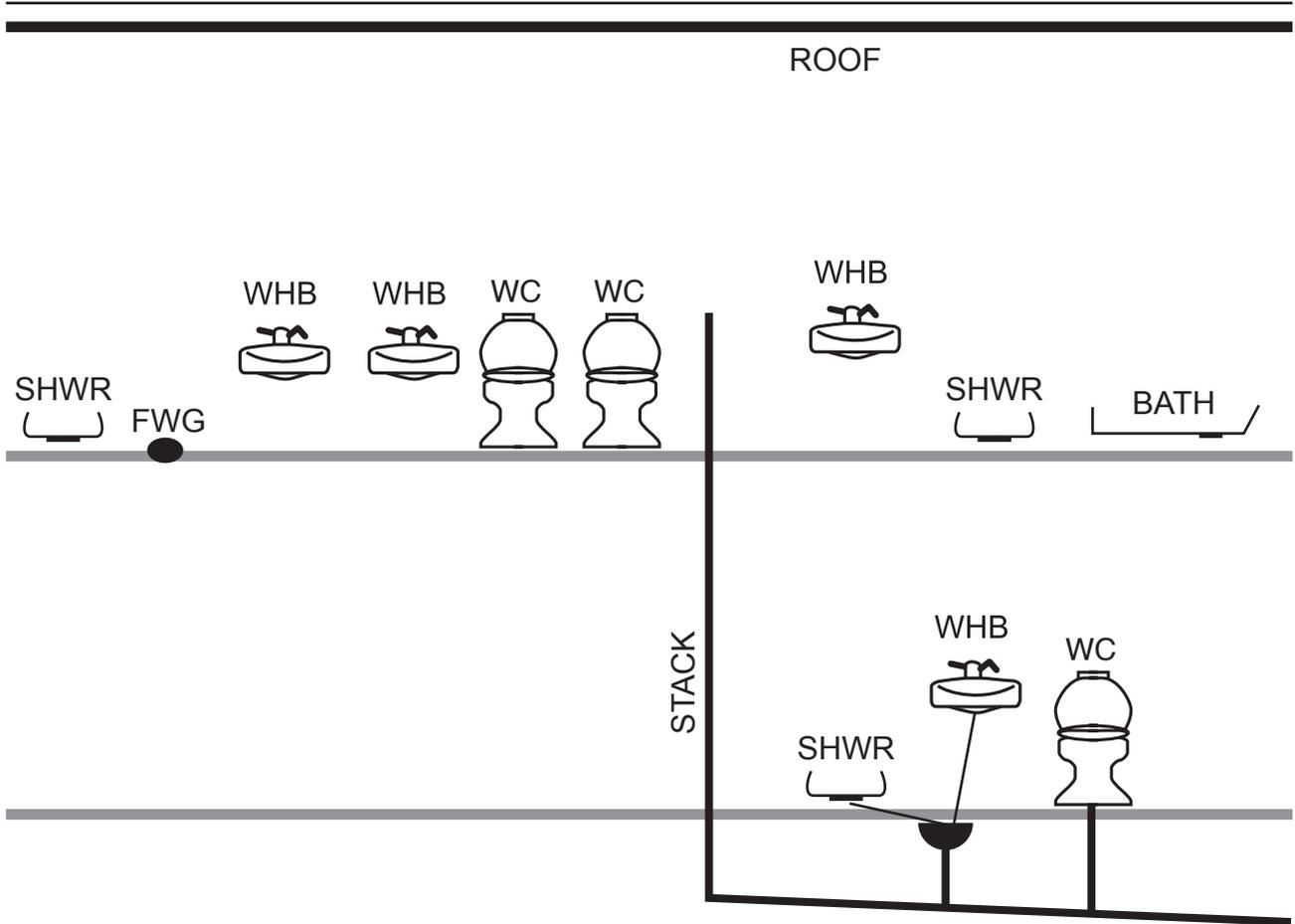
The drawing below shows a plan view of the sanitary fixtures on the first level of a dwelling.

The fixtures are to discharge to the drainage system via a single stack installed in the location marked A.



Complete the elevation view on the following page to show the discharge and vent pipework required to complete the installation. The sanitary discharge pipework is to comply with the minimum requirements of AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

QUESTION 3 (cont'd)



Total 10 marks

QUESTION 4

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.

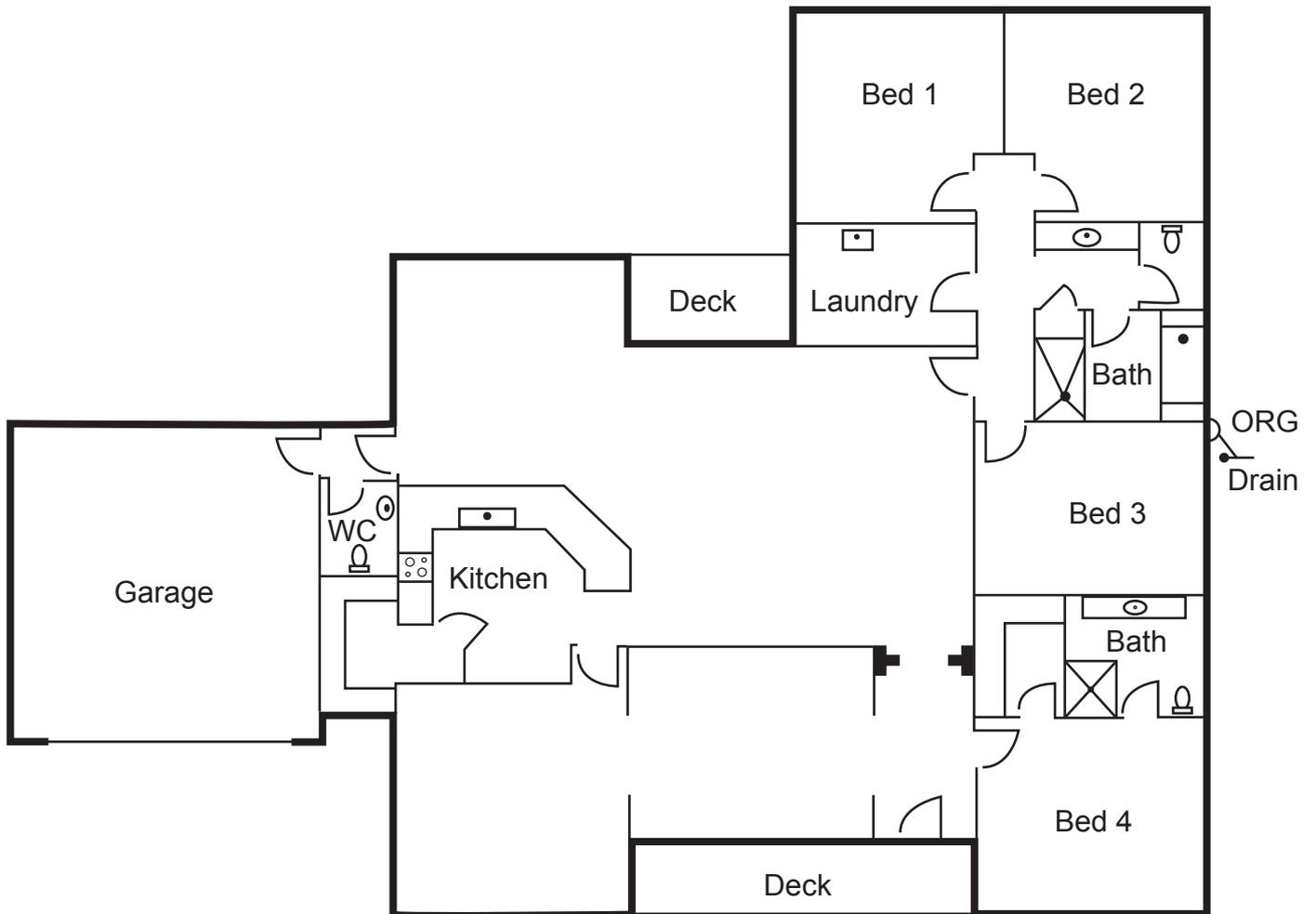
The drainage design for the dwelling has been completed, and the connection point for the sanitary plumbing is shown on the plan.

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

- (a) On the plan, draw all discharge pipes and show vent connections that will be required to be installed before the concrete floor is poured.
- (b) On the plan, show the minimum allowable diameter for each section of discharge and vent pipework.

Total 9 marks

QUESTION 4 (cont'd)



QUESTION 5

A local authority has water restrictions in place and has prohibited the use of water from the local main for testing sanitary discharge pipework.

(a) Give TWO other ways the pipework could be tested to ensure it is water tight.

- 1 _____
- 2 _____

(1 mark)

(b) Choose one of the answers given above, and give the procedure that must be followed to complete this test.

Method

Procedure

(3 marks)

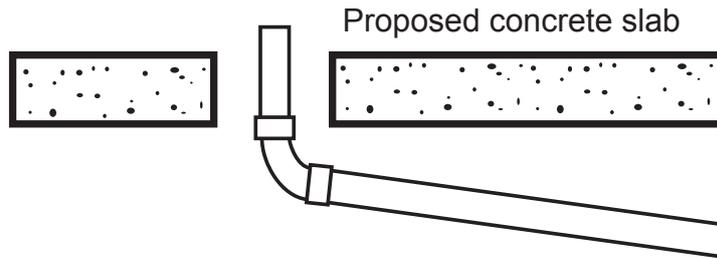
Total 4 marks

QUESTION 6

A uPVC discharge pipe is to be installed to comply with New Zealand Building Code clause G13/AS2 Foul Water.

The starter drawing below shows a uPVC discharge pipe installed through a proposed concrete pad to serve a WC pan in the dwelling.

- (a) Complete the drawing to show the installation requirements to be met to protect the pipe before the concrete is poured.



(2 marks)

- (b) State the minimum clearance between the top of the pipe and the underside of the slab.

(1 mark)

- (c) The pipe will receive the discharge from two soil fixtures.

Give the additional requirements that must be included in the installation.

(2 marks)

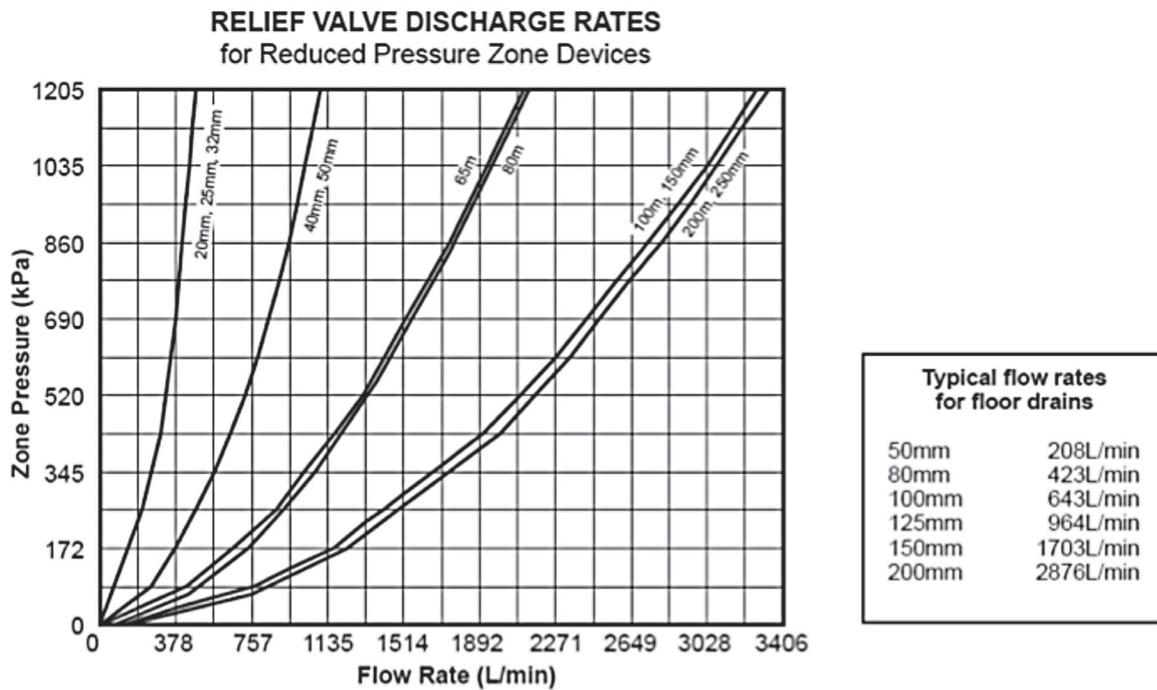
- (d) State the length of time that the pipe must last to comply with the New Zealand Building Code.

(1 mark)

Total 6 marks

QUESTION 7

The graph below shows the expected discharge rates from the relief port of reduced pressure zone backflow prevention devices.



Using the graph, determine the rate of discharge and the required diameter of the drain for each of the following reduced pressure zone device installations.

- (a) (i) A DN 20 mm device operating at 775 kPa.

Discharge rate: _____

Required drain diameter: _____

(1 mark)

- (ii) A DN 65 mm device operating at 520 kPa.

Discharge rate: _____

Required drain diameter: _____

(1 mark)

QUESTION 7 (cont'd)

- (b) Explain why a double check valve is not suitable for providing protection against high hazard rating situations.

(1 mark)

- (c) Explain why a vacuum breaker device cannot provide suitable protection against back pressure backflow.

(1 mark)

Total 4 marks

QUESTION 8

(a) Listed below are three different methods of supplying water to flush a urinal.

Give an advantage and a disadvantage for each method.

(i) Cistern with flushing valve

Advantage

Disadvantage

(ii) Infrared sensor and solenoid valve

Advantage

Disadvantage

(iii) Cistern with syphonic valve

Advantage

Disadvantage

(6 marks)

QUESTION 8 (cont'd)

(b) A 4.5 metre wide slab type urinal is to be installed on a fully vented modified stack system to comply with AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

(i) State the minimum number of waste outlets the urinal must have.

(1 mark)

(ii) State the minimum allowable diameter for the discharge pipe receiving waste from the urinal.

(1 mark)

(iii) Give the maximum allowable length for the discharge pipework if no vent is to be installed.

(1 mark)

Total 9 marks

QUESTION 9

Draw and label a diagram showing an acceptable design for all the pipework necessary for the efficient operation of an over and under hot water system with a dual energy input (i.e. wet-back and electric storage). The position of the storage water heater has been drawn below as a starter for your sketch.

Your sketch should show:

- (i) connections to the storage water heater
- (ii) the wet-back heat exchanger
- (iii) pipework
- (iv) the recommended heights between the storage water heater and the wet-back pipework
- (v) venting
- (vi) lagging/insulation.



Total 7 marks



QUESTION 10

(a) Give SIX factors that should be considered when a solar water heating system is being designed.

- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____
- 6 _____

(3 marks)

(b) State FIVE checks that should be carried out during the maintenance on a solar collector panel.

- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____

(5 marks)

Total 8 marks

QUESTION 11

A fire collar is to be fitted to a uPVC water pipe that passes through the concrete wall of a plant room.

(a) Explain the purpose of the fire collar.

(2 marks)

(b) Explain how the fire collar achieves its intended purpose.

(2 marks)

(c) The fire rating of a plant room is higher than the fire rating of an adjacent room.

State how the rating of the fire collar is determined.

(1 mark)

Total 5 marks

QUESTION 12

A potable water storage tank is installed to comply with AS/NZS 3500 Part 1: Water services.

(a) Give TWO instances when the water storage tank must be cleaned and disinfected.

1 _____

2 _____

(2 marks)

(b) Give TWO factors that must be taken into account when calculating the concentration of chlorine that will be required for disinfecting the water storage tank.

1 _____

2 _____

(2 marks)

Total 4 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. What is the minimum permitted storage capacity for a solar water heating system with 7 m² of solar panels?

- A 150 litres.
- B 200 litres.
- C 250 litres.
- D 300 litres.
- E 350 litres.

2. Why must a minimum capacity be provided for hot water storage in a solar water heating system?

- A To prevent the system from overheating.
- B To provide the water at an adequate temperature.
- C To prevent the growth of legionella bacteria.
- D To ensure there is enough water to meet the demand.
- E To give an equal volume of water in the cylinder and panels.

3. A reduced pressure zone backflow prevention device is installed and all of the downstream outlets are turned off.

Which of the following correctly describes the position of each valve within the device for this situation?

- A Both check valves open and relief valve open.
- B Both check valves open and relief valve shut.
- C Both check valves shut and relief valve open.
- D Both check valves shut and relief valve shut.
- E First check valve open, second check valve and relief valve shut.

4. What is the minimum distance above the highest outlet at which an atmospheric vacuum breaker can be installed?
- A 100 mm.
 - B 150 mm.
 - C 200 mm.
 - D 250 mm.
 - E 300 mm.

5. How often must a backflow prevention device be tested?
- A Once a month.
 - B Once every 6 months.
 - C Once every year.
 - D Once every 2 years.
 - E Once every 5 years.

6. Who is responsible for ensuring that a backflow prevention device is periodically tested?
- A An architect.
 - B An independently qualified person.
 - C The installing plumber.
 - D The building owner.
 - E The local territorial authority.

7. A water service carrying non-potable water is to be installed.
Which colour pipe or marking should be used to enable future identification of the pipe?
- A Lilac.
 - B Orange.
 - C Pink.
 - D Red.
 - E Yellow.

8. When installed underground, what is the minimum allowable separation between parallel potable and non-potable water supply pipework?
- A 200 mm.
 - B 300 mm.
 - C 500 mm.
 - D 600 mm.
 - E 1000 mm.

9. Within which distance from the top and from the bottom of a hot water storage cylinder must a seismic restraint be fitted?
- A 50 mm.
 - B 75 mm.
 - C 100 mm.
 - D 150 mm.
 - E 200 mm.
10. A third seismic restraint is required to be fitted to a hot water storage cylinder exceeding what capacity?
- A 150 litres.
 - B 200 litres.
 - C 250 litres.
 - D 300 litres.
 - E 350 litres.

Total 10 marks

For Examiner's use only

Question number	Marks	Marks
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
Section B		
Total		