

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 2016

# 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**

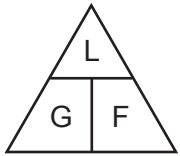
Candidates that sat this examination in November 2016 were provided with the following documents:

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

## USEFUL FORMULAE

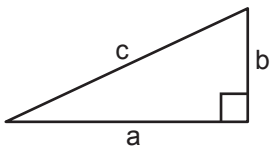
Circumference of circle =  $2 \times \pi \times R$  or Circumference of circle =  $\pi \times D$

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

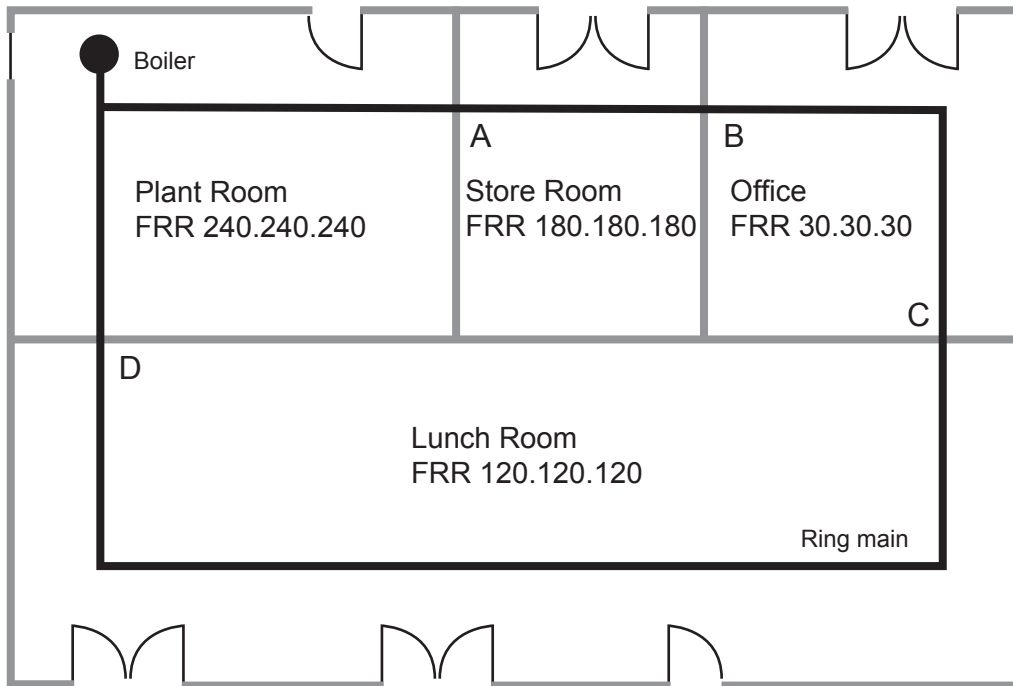
$L$  = length of pipe in metres

## SECTION A

### QUESTION 1

The diagram below shows a ring main installed to supply hot water from the boiler situated in the plant room to outlets at each of the other rooms in the building.

Included on the diagram is the Fire Resistance Rating (FRR) for each fire cell.



Complete the table to show the rating of fire collar that must be installed at each of the penetrations labelled A – D.

Location	Fire collar required
A	
B	
C	
D	

**Total 4 marks**

## QUESTION 2

The plan on the page opposite shows the layout of sanitary fixtures for a proposed dwelling. The plan 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 disconnector gully (DG) is to be charged with the waste from the ensuite basin.

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

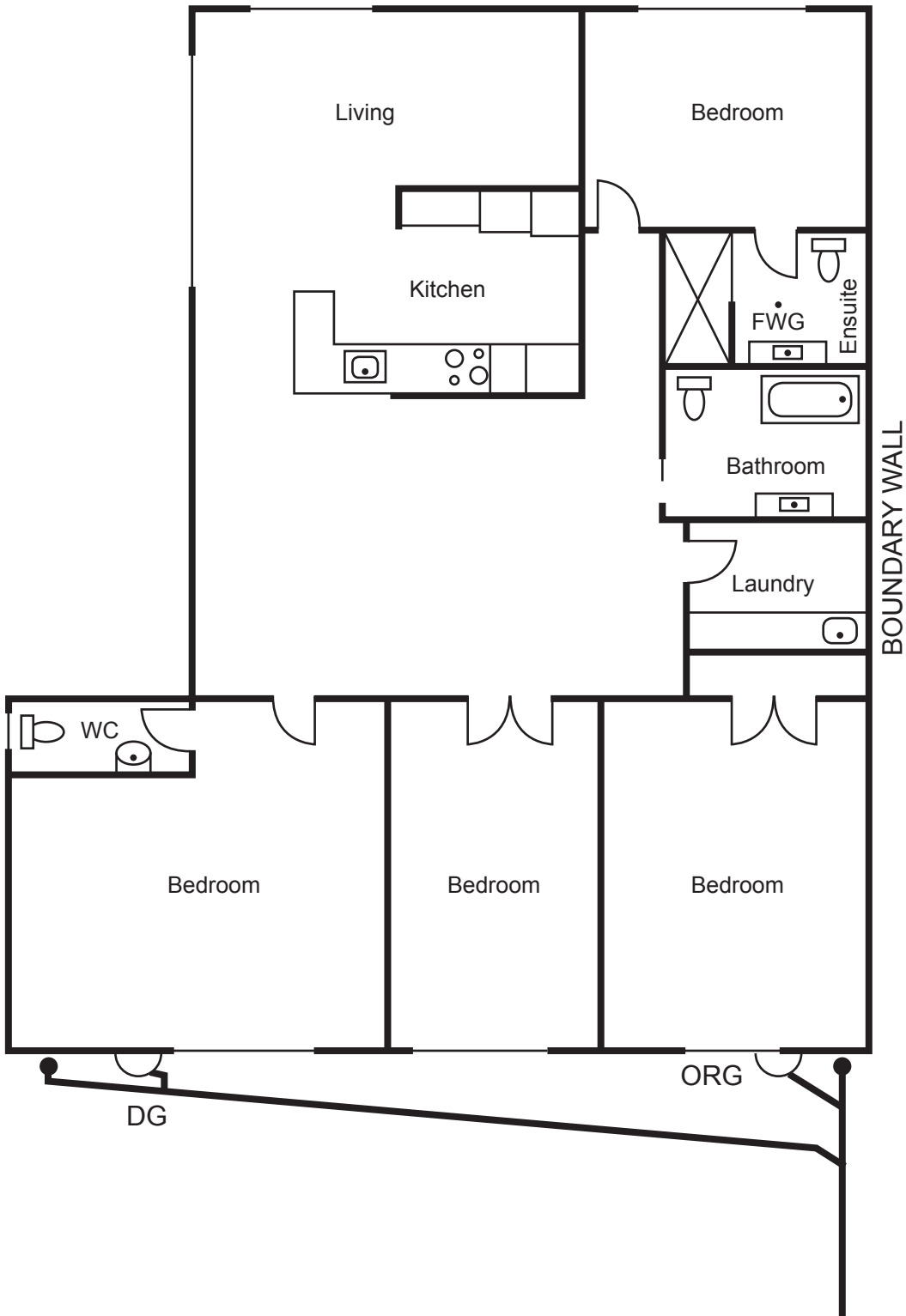
- (a) Draw on the plan the location of all discharge pipes and vents.
- (b) Show on the plan the minimum allowable diameter for each section of discharge and vent pipework.

**Total 9 marks**

**QUESTION 2 (cont'd)**



Scale 1:100



**QUESTION 3**

Answer the following to comply with New Zealand Building Code clause G13/AS1 Foul Water.

(a) State FOUR situations in which a vent must be fitted to a fixture discharge pipe.

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_
- 3 \_\_\_\_\_
- 4 \_\_\_\_\_

(4 marks)

(b) (i) State when a relief vent must be installed on a discharge stack.

\_\_\_\_\_

(1 mark)

(ii) Give the minimum allowable diameter for a relief vent serving a 100 mm diameter stack.

\_\_\_\_\_

(1 mark)

(iii) Give the TWO requirements that must be met relating to the connection of the relief vent to the base of the discharge stack.

1 \_\_\_\_\_

2 \_\_\_\_\_

(2 marks)

(iv) Give TWO reasons why a relief vent is fitted to a soil or waste stack.

1 \_\_\_\_\_

2 \_\_\_\_\_

(2 marks)

**QUESTION 3 (cont'd)**

(c) (i) State the minimum allowable gradient for the installation of a vent pipe.

\_\_\_\_\_

(1 mark)

(ii) Give the two outcomes that installing the vent at gradient in (c)(i) achieves.

1 \_\_\_\_\_

2 \_\_\_\_\_

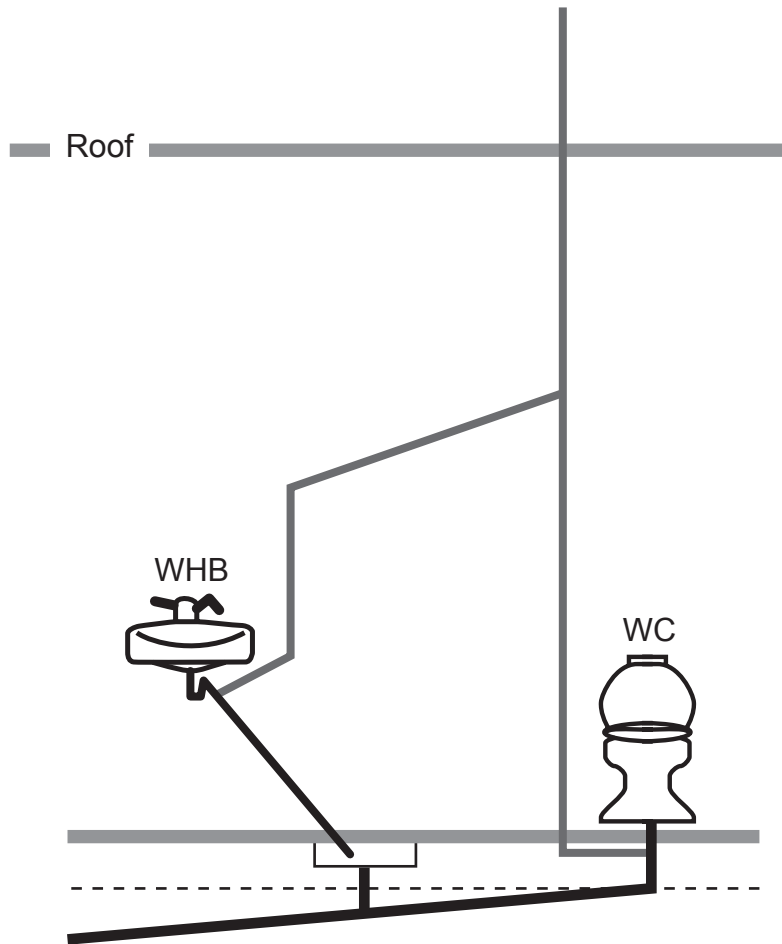
(2 marks)

**Total 13 marks**



### QUESTION 4

The diagram below shows the discharge and vent pipework for the installation of a WC Pan and basin.



Explain the error that has been made and the possible consequence that may result.

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Total 2 marks

### QUESTION 5

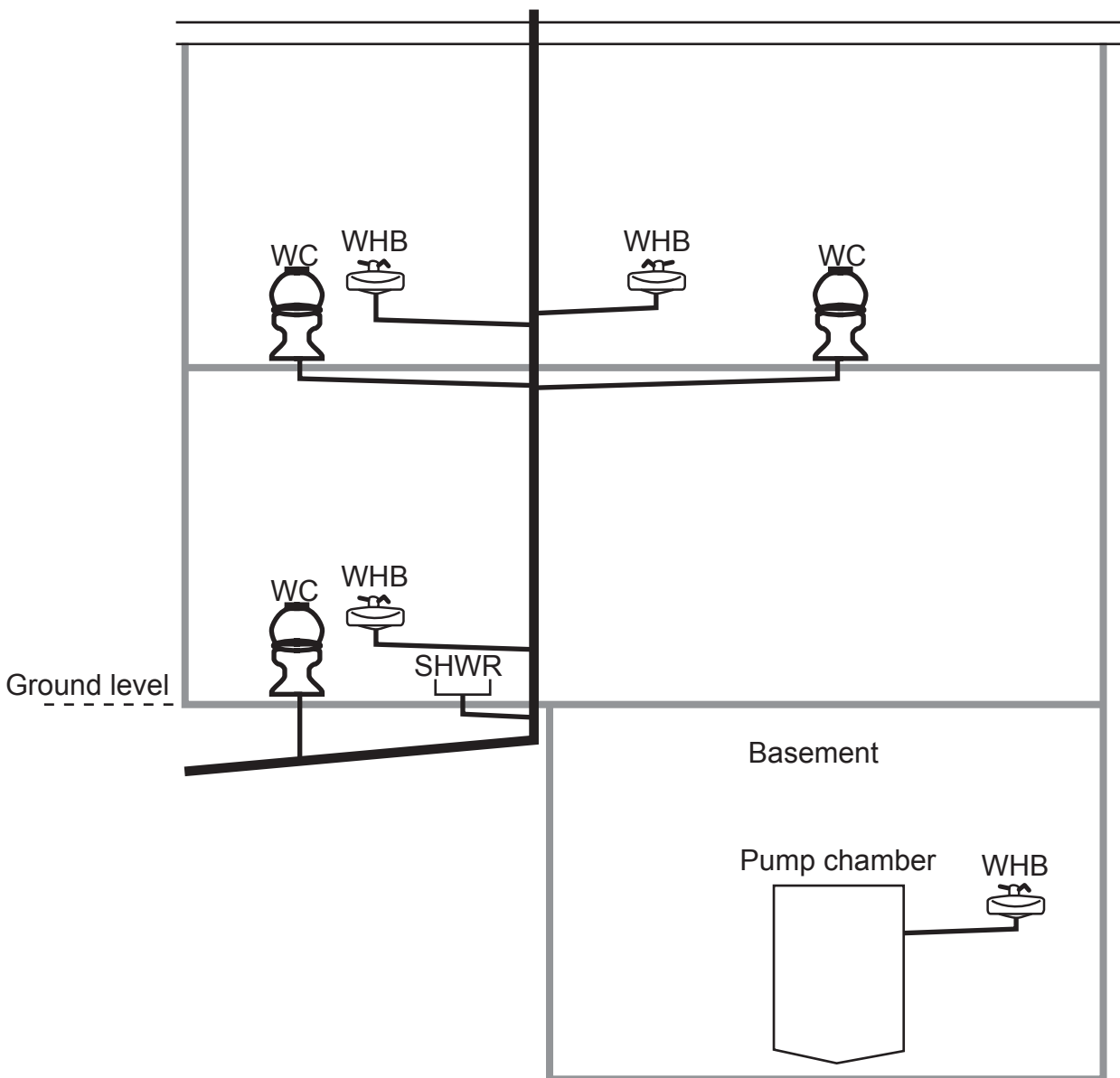
The drawing below shows an elevation of part of a sanitary plumbing installation.

The wash hand basin in the basement is below the level of the drain, and therefore discharges into a pump chamber.

Complete the drawing to show the requirements that must be met for the installation of the pump chamber and the discharge system to carry the waste to the outfall. The complete installation is to comply with the minimum requirements of AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

Label all components, and show the minimum allowable diameter for the pipework you have drawn.

Show on the drawing the maximum allowable water level before the pump must activate and the measurement used to determine it.

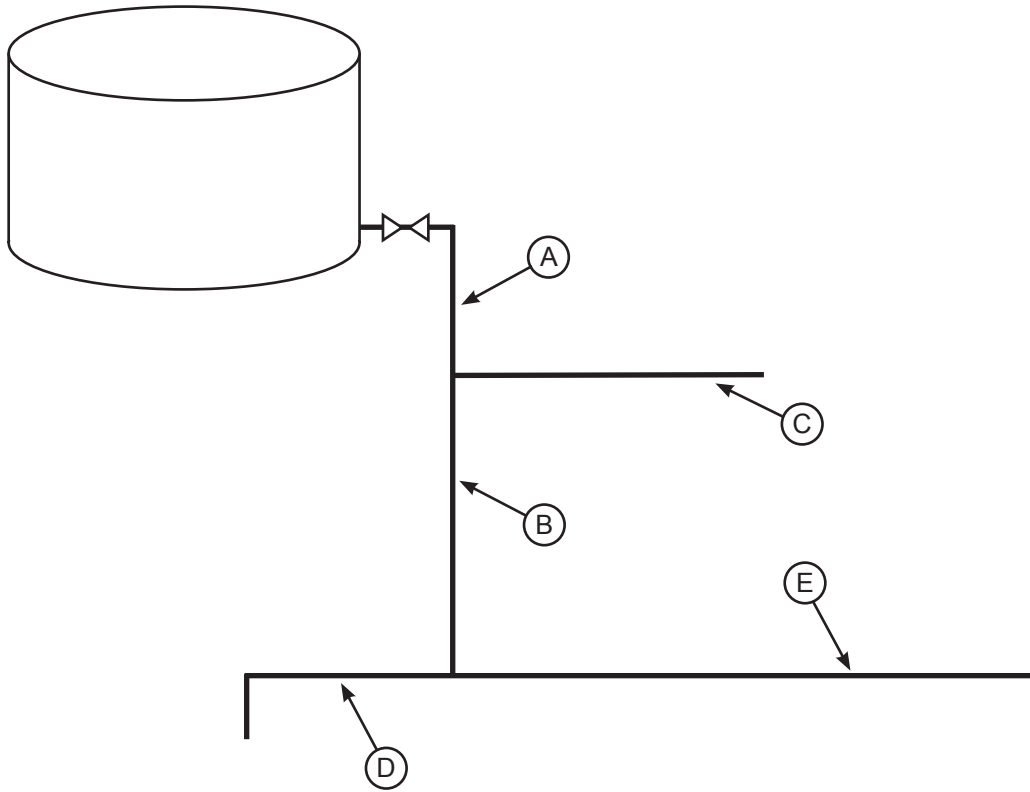


Total 8 marks

## QUESTION 6

The diagram below is a schematic of the potable cold water pipework from a 1500 litre tank to a series of cold water outlets.

The cold water pipework dimensions are given in the table below the diagram.



Section of pipework	Length	Diameter (ID)
A	3 metres	32 mm
B	4 metres	25 mm
C	4 metres	20 mm
D	3 metres	15 mm
E	7 metres	15 mm



## QUESTION 7

An open-vented hot water cylinder is connected to a wetback. The cylinder is to be replaced.

(a) Describe a situation in which a building consent is required.

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(1 mark)

(b) Describe a situation in which a building consent would NOT be required.

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(1 mark)

(c) State the period of time a building consent remains current if the project for which it was issued has not been started.

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(1 mark)

**Total 3 marks**

## QUESTION 8

- (a) State THREE conditions that should be checked before the atmosphere of a confined space can be considered safe.

1 \_\_\_\_\_

2 \_\_\_\_\_

3 \_\_\_\_\_

(3 marks)

- (b) Give FOUR items in addition to standard personal protection equipment that should be supplied to the person monitoring people working within a confined space.

1 \_\_\_\_\_

2 \_\_\_\_\_

3 \_\_\_\_\_

4 \_\_\_\_\_

(4 marks)

**Total 7 marks**

## QUESTION 9

The drawing opposite is a schematic diagram of the cold water supply pipework for a commercial operation. Possible locations for backflow prevention devices are shown numbered 1-16.

Reduced pressure zone (RPZ) devices, double check valve assemblies (DCVA) and at least one atmospheric vacuum breaker (AVB) are to be used to complete the backflow prevention system.

The system is to comply with the minimum requirements of New Zealand Building Code Clause G12/AS1 Water Supplies.

(a) Backflow prevention is provided at location 1.

In the table below, write the number of the FIVE locations where a backflow prevention device must be installed.

Location number	Hazard rating	Device type
1	High	RPZ

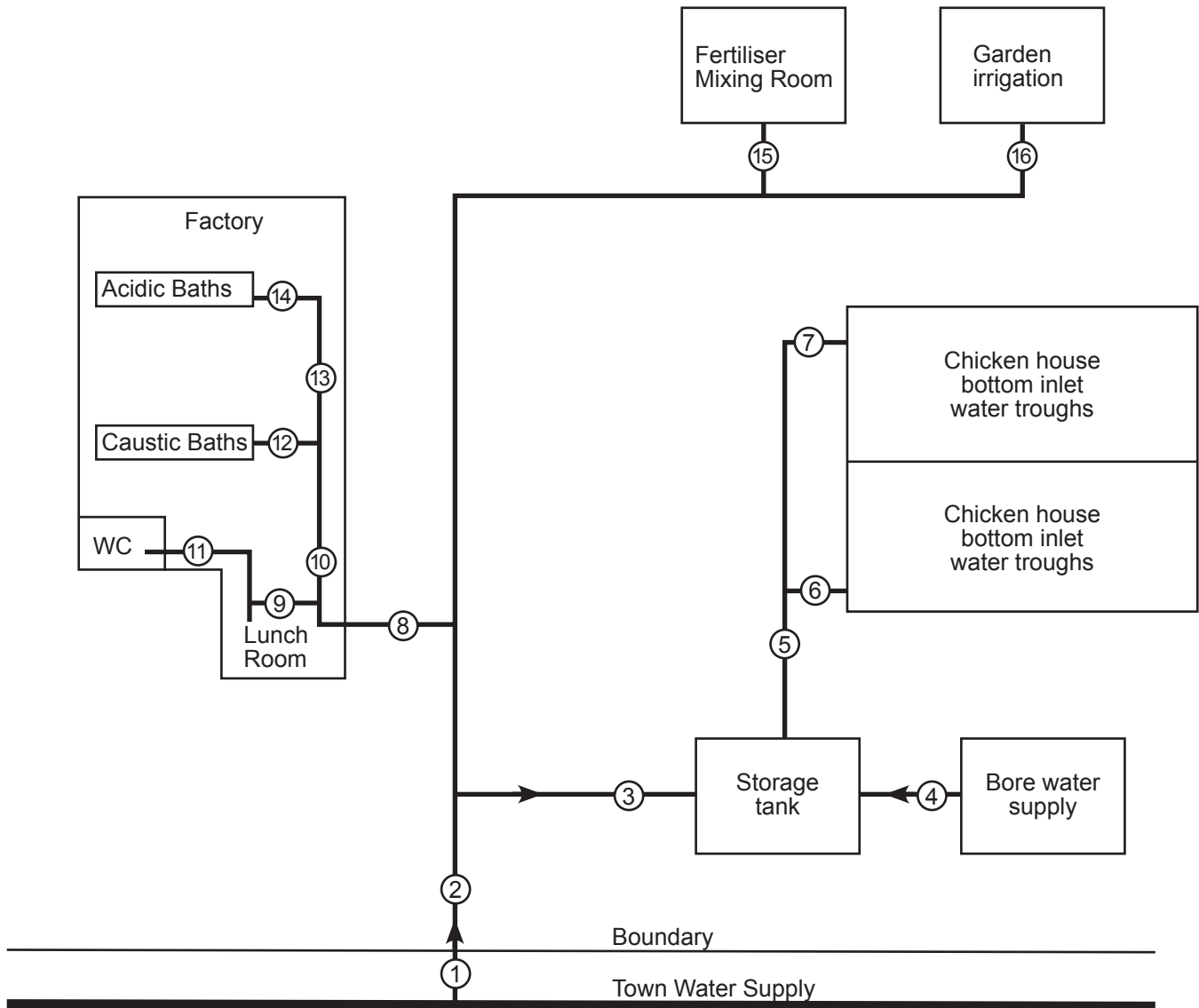
(b) For each location identified in (a), complete the table to show:

- the hazard rating
- the device type.

The first row of the table has been completed for you as an example.

Total 15 marks

QUESTION 9 (cont'd)





**QUESTION 10**

(a) Complete the table below to identify which hazard management category each of the actions listed fits into.

Action	Minimise	Eliminate
Wearing safety glasses		
Replacing a noisy machine		
Completing work usually performed at heights on ground level		
Providing screens around an area where welding is taking place		
Using earmuffs or ear plugs		
Fitting safety guards to machinery		
Training staff in correct use of equipment		
Using edge protection when working at heights		

(4 marks)

(b) (i) The Health and Safety at Work Act defines 'notifiable injury or illness' in relation to a person.

Give SIX examples of injuries or illnesses that would be in this category.

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_
- 3 \_\_\_\_\_
- 4 \_\_\_\_\_
- 5 \_\_\_\_\_
- 6 \_\_\_\_\_

(3 marks)

(ii) Name the government agency who must be advised when any notifiable injury or illness situation has occurred.

\_\_\_\_\_

(1 mark)

**QUESTION 10 (cont'd)**

(iii) State the requirement regarding the timing of notification to the agency in (b).

\_\_\_\_\_

(1 mark)

(iv) Give THREE instances in which the scene of a notifiable event may be disturbed.

1 \_\_\_\_\_

2 \_\_\_\_\_

3 \_\_\_\_\_

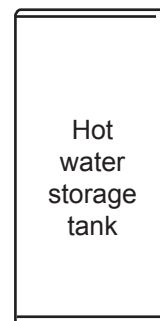
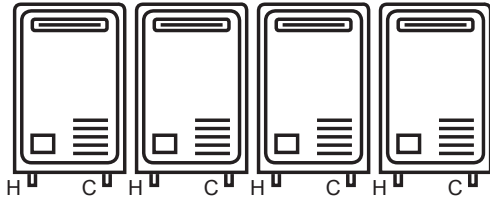
(3 marks)

**Total 12 marks**

### QUESTION 11

The starter drawing below shows a bank of four continuous-flow water heaters that are to be used as the sole source of heating for the water contained in the hot water storage tank. The tank will supply sanitary fixtures in the building.

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



  
COLD WATER MAIN

Total 8 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 maximum allowable temperature for hot water supplied to a basin in an aged care facility?

A 32°C.

B 36°C.

C 45°C.

D 50°C.

E 55°C.

2. What is the minimum allowable pressure for a soundness test on cold water pipework?

A 100 kPa.

B 500 kPa.

C 1000 kPa.

D 1500 kPa.

E 2000 kPa.

3. Which of the following determines the inclination that a solar panel must be installed at to gain maximum efficiency?

A The pitch of the roof.

B The latitude of the installation.

C The longitude of the installation.

D The type of solar collector installed.

E The pressure rating of the pump installed.

4. In a solar water heating system, which part is known as the collector?

- A The solar panel manifold system.
- B The drain tundish.
- C The circulating pump.
- D The solar panel.
- E The water storage cylinder.

5. Which of the following is a solar preheater?

- A A solar water heating system that feeds an electric storage water cylinder.
- B A pump that circulates warm water when panel temperatures drop to near freezing.
- C An electric element that raises the water temperature slightly to start a thermo-syphon current.
- D A water heating system that relies solely on solar energy to reach the desired temperature.
- E The selective surface coating that directs rays to the solar tubes.

6. Which of the following is an advantage of using an indirect heating system?

- A Higher temperatures can be achieved.
- B The temperature can be maintained at a more stable level.
- C One heat source can be used for both potable and non-potable hot water supplies.
- D The pressure rating of the circulating pump can be increased.
- E A tempering valve is not required on the installation.

7. Which of the following components would you NOT expect to find in a thermo-siphon solar water heating system?

- A A non-return valve.
- B A pump.
- C An element.
- D A thermostat.
- E An air eliminator/vent.

8. When is it permitted to bypass a backflow prevention device supplying an installation?
- A When the bypass has the same rating as the device being bypassed.
  - B During maintenance procedures.
  - C While testing of the backflow assembly takes place.
  - D Only at non-peak usage times.
  - E In an emergency fire-fighting situation, where a high flow rate is required.
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9. When is an air gap not an adequate backflow prevention method?
- A On a tank supplying a reduced pressure zone assembly.
  - B When used on a bidet storage tank.
  - C In a medium hazard situation.
  - D In a high hazard situation.
  - E When installed in a toxic environment.
- 

10. Who is responsible for organising the periodic testing of a backflow prevention device?
- A The local Territorial Authority.
  - B The installing plumber.
  - C The architect.
  - D The building owner.
  - E An independently qualified person.
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11. What is the minimum period pipework concealed behind wall linings must last in order to be compliant with the New Zealand Building Code?

- A 1 year.
- B 2 years.
- C 5 years.
- D 15 years.
- E 50 years.

12. What is the minimum time a hot water cylinder relief drain installed under a concrete slab must last to meet the durability requirements of the New Zealand Building Code?

- A 1 year.
- B 2 years.
- C 5 years.
- D 15 years.
- E 50 years.

**Total 12 marks**

For Examiner's use only

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