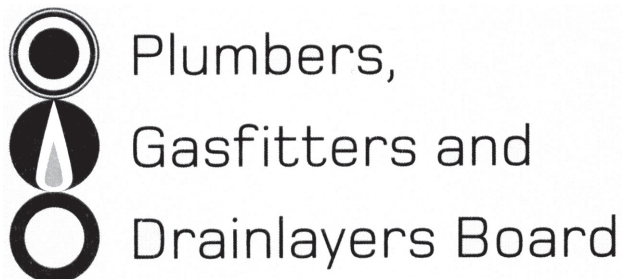


Affix label with Candidate Code
Number here.
If no label, enter candidate
Number if known

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No. 9195



REGISTRATION EXAMINATION, JUNE 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 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

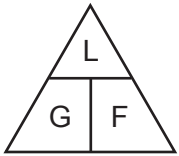
Candidates that sat this examination in June 2016 were provided with the following documents:

- AS/NZS 3500 Part 1: Water services
- AS/NZS 3500 Part 2: Sanitary plumbing and drainage

USEFUL FORMULAE

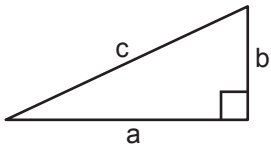
Circumference of circle = $2 \times \pi \times R$ or Circumference of circle = $\pi \times D$

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

A 65 mm diameter hot water ring main is to be installed in a motel block.

Each motel unit is to be connected to the ring main by a single 20 mm diameter pipe.

(a) Calculate the maximum number of motel units the ring main can supply.

Formula:

$$N = \sqrt{\left(\frac{D}{d}\right)^5}$$

where

N = number of laterals (branches)

D = diameter of the ring main

d = diameter of the laterals

(3 marks)

(b) Give TWO solutions that would provide tempered water to the outlets and also protect the ring main system from legionella bacteria.

1 _____

2 _____

(2 marks)

(c) The ring main is to be fitted with a circulating pump.

State where in the circuit the pump should be fitted.

(1 mark)

Total 6 marks

QUESTION 2

Five houses are to be built down a right-of-way, as shown in the plan on the opposite page.

The pressure available from the public water supply is 525 kPa.

The height of the highest fixture outlet is 2.2 m above the public water supply connection point A.

The minimum head required for the fixture outlets is 5 m.

The length of consumer pipework from the toby labelled H to the furthest outlet is 9 m.

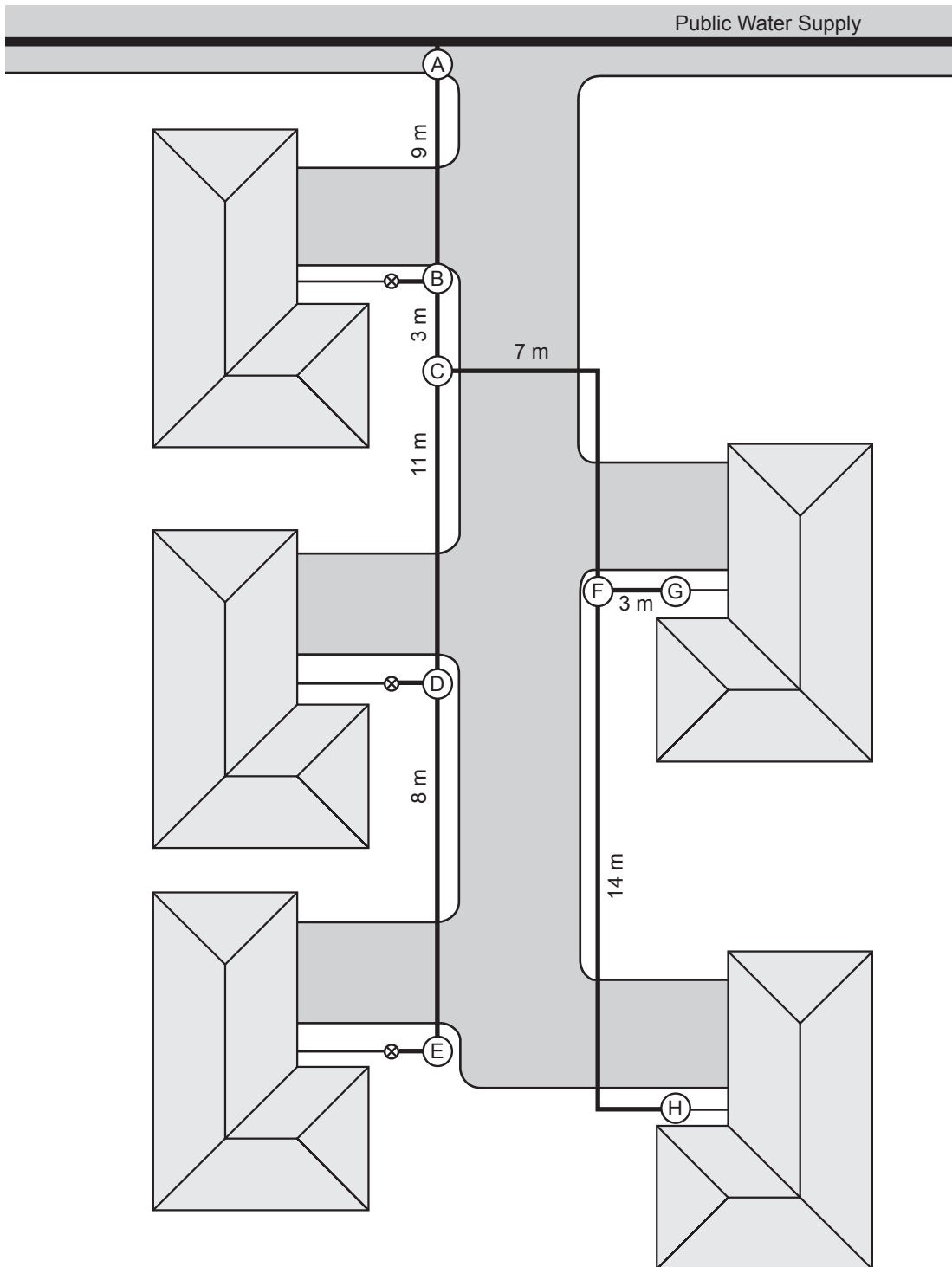
Using the procedure in AS/NZS 3500 Part 1: Water supplies Appendix D, complete the tables below to size the pipework.

| Index length of installation | Pressure drop |
|------------------------------|---------------|
| | |

| Pipe Section | Probable simultaneous demand (L/s) | Nominal pipe size (DN) |
|--------------|------------------------------------|------------------------|
| A – B | | |
| B – C | | |
| C – D | | |
| D – E | | |
| C – F | | |
| F – G | | |
| F – H | | |

Total 17 marks

QUESTION 2 (cont'd)



QUESTION 3

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.

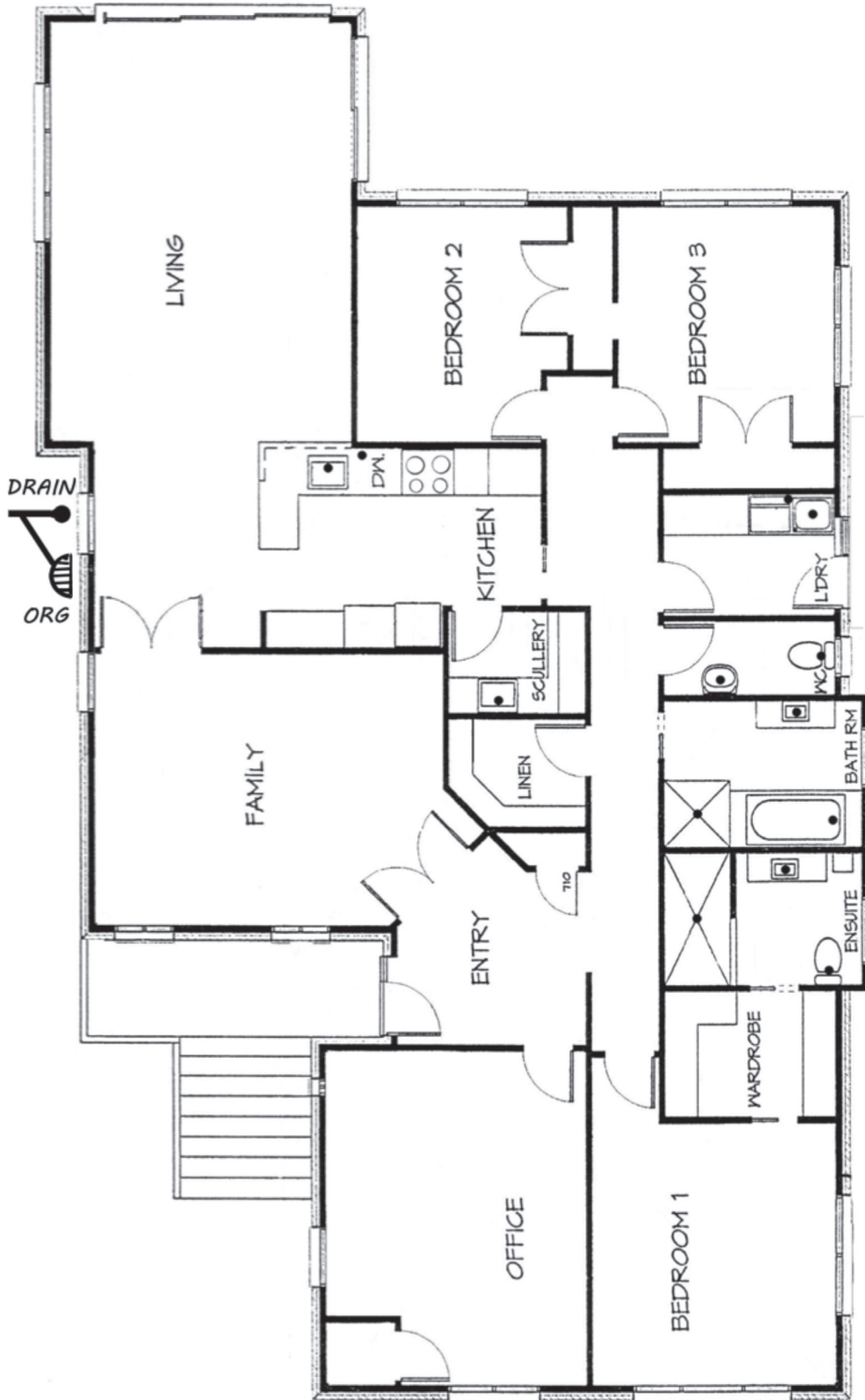
The drainage design for the dwelling has been completed, and the connection point for the sanitary plumbing is as shown on the plan.

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

- (a) On the plan, draw all discharge pipes and show the location of any required vent(s).
- (b) On the plan, show the minimum allowable diameter for each section of discharge and vent pipework.

Total 9 marks

QUESTION 3 (cont'd)

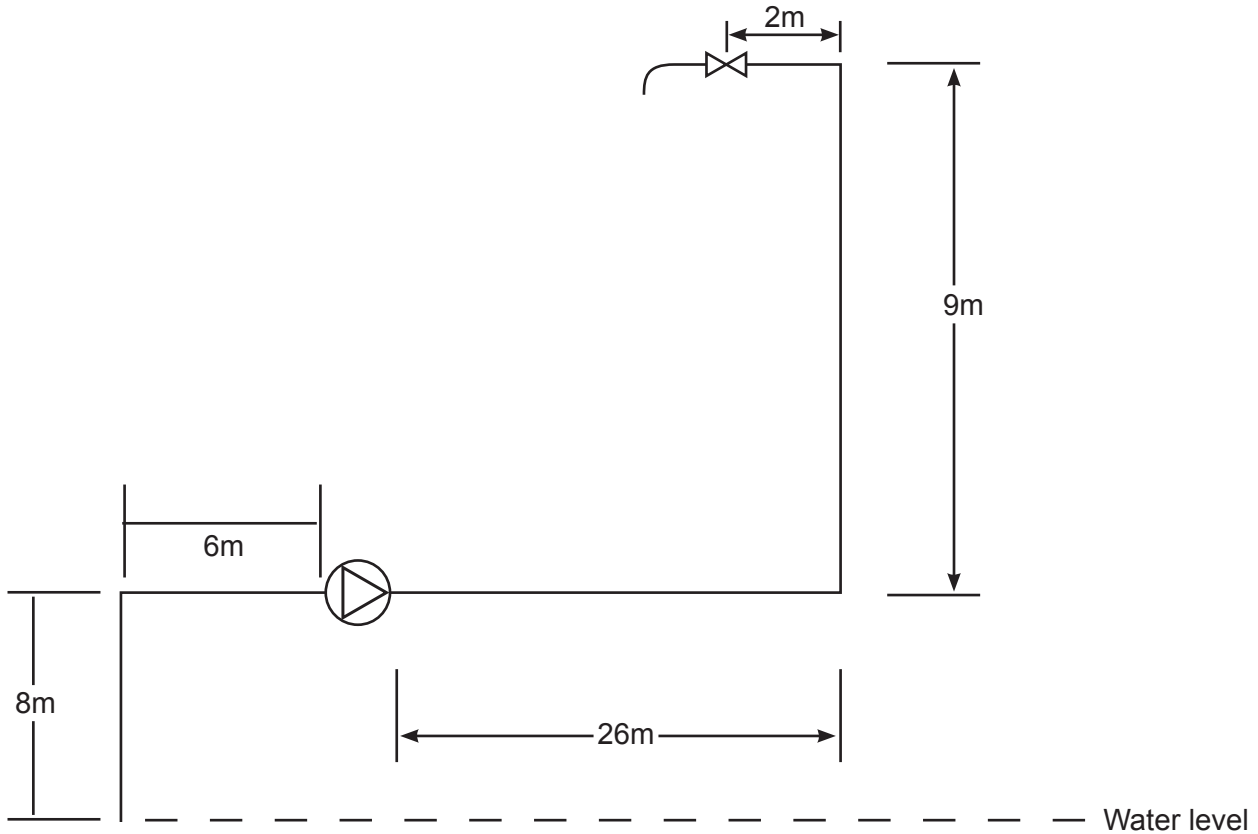


QUESTION 4

The diagram below shows pipework associated with a pumping system.

The delivery pipe is 32 mm diameter polyethylene.

The discharge at the valved outlet is to be 6500 litres per hour.



The following table shows pipe friction loss (metres loss per 100 metres of pipe) for polyethylene and PVC pipes. Allowance has been included for pipe fittings.

| Litres/ Min | POLYETHYLENE PIPE (diameter) | | | | | | PVC PIPE (diameter) | | |
|----------------|------------------------------|-------|-------|-------|-------|-------|---------------------|-------|-------|
| | 15 mm | 20 mm | 25 mm | 32 mm | 40 mm | 50 mm | 32 mm | 40 mm | 50 mm |
| 11 | 25 | 3 | 1 | -- | -- | -- | -- | -- | -- |
| 23 | 90 | 12 | 3 | 1 | 0.5 | -- | 0.4 | -- | -- |
| 45 | -- | 40 | 10 | 4 | 1.5 | -- | 0.3 | 1.2 | 0.5 |
| 68 | -- | 80 | 20 | 8 | 3 | 0.7 | 2.1 | 0.6 | 0.2 |
| 90 | -- | -- | 30 | 13 | 5 | 1.3 | 3.2 | 1 | 0.4 |
| 114 | -- | -- | 50 | 20 | 8 | 2 | 4.2 | 1.6 | 0.6 |
| 136 | -- | -- | 60 | 25 | 10 | 3 | 6 | 2.1 | 0.8 |
| 159 | -- | -- | -- | 30 | 14 | 4 | 8 | 2.8 | 1 |
| 182 | -- | -- | -- | 40 | 18 | 5 | 10 | 3.8 | 1.2 |
| 227 | -- | -- | -- | 60 | 27 | 7 | 20 | 5.2 | 1.7 |
| 273 | -- | -- | -- | -- | 38 | 9 | 22 | 7.4 | 2.5 |
| 318 | -- | -- | -- | -- | 50 | 12 | 25 | 9.5 | 3.3 |

QUESTION 4 (cont'd)

Use the diagram and the table to answer the following questions. Show all working.

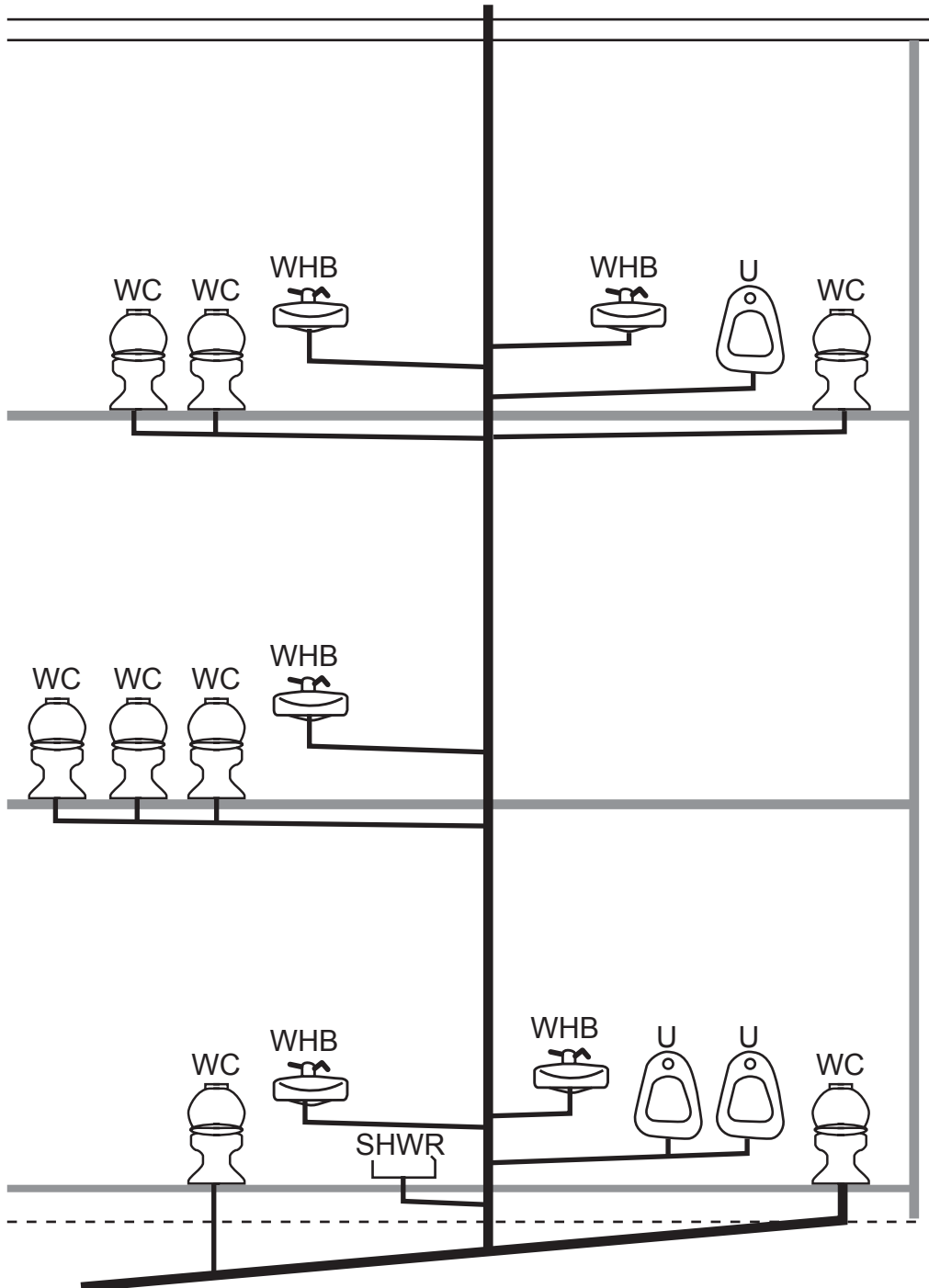
Calculate the total delivery head (static delivery head + friction loss in delivery pipe).

Total 4 marks

QUESTION 5

The diagram below shows sanitary fixtures connected to a vertical stack.

Complete the diagram by drawing the required vent pipe work for the system to comply with the minimum requirements of New Zealand Building Code Clause G13/AS1.



Total 6 marks

QUESTION 6

- (a) A rural home has been supplied by bore water. The bore supply is no longer suitable and the owner has decided to install a tank to store rain water collected from the roof and supply the house via a new pump.

Give SIX factors regarding the existing site that need to be checked to ensure the rain water collected will be potable.

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

(3 marks)

- (b) Give TWO different components that could be included in the installation to help maintain the water quality before the water enters the tank.

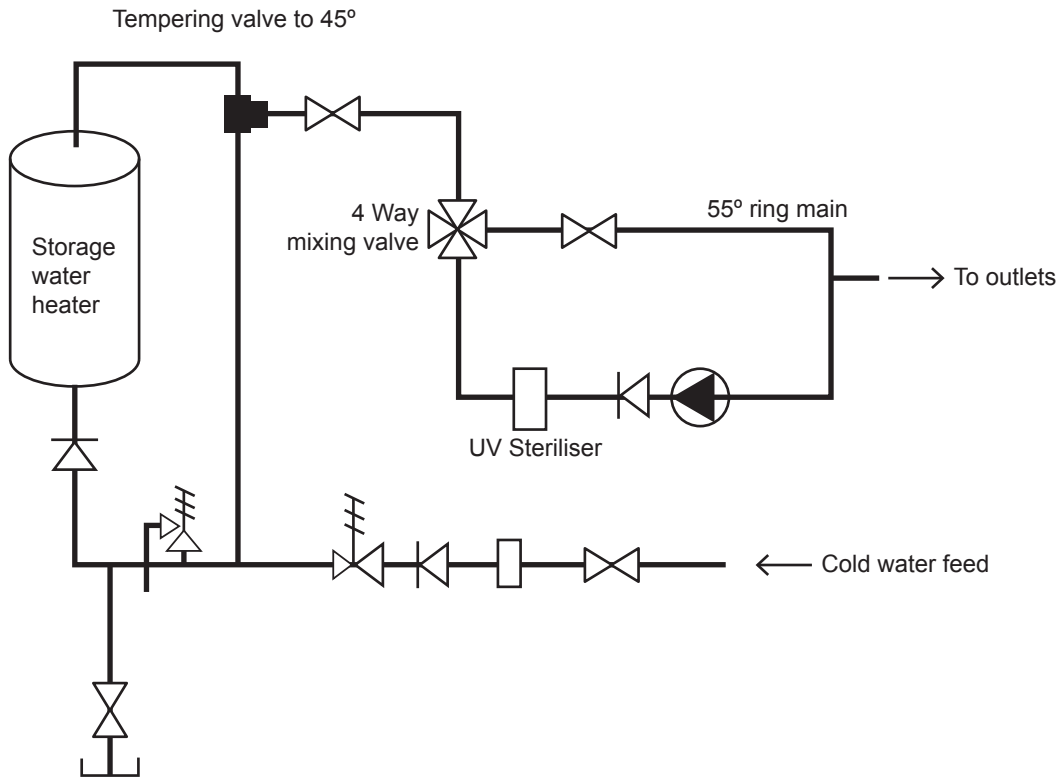
- 1 _____
- 2 _____

(2 marks)

Total 5 marks

QUESTION 7

The schematic diagram below shows a proposed plumbing system installation.



- (a) Identify FOUR design flaws with the proposed layout by circling and numbering the location of each fault.

(2 marks)

- (b) Give an explanation why the design flaws identified in (a) would cause problems with the plumbing system.

Fault numbered 1 _____

Fault numbered 2 _____

Fault numbered 3 _____

Fault numbered 4 _____

(4 marks)

Total 6 marks

QUESTION 8

- (a) Name THREE formal documents or pieces of legislation that contain information regarding the conditions that must be met in relation to who may carry out sanitary plumbing work.

1 _____

2 _____

3 _____

(3 marks)

- (b) Name TWO compliance documents that provide acceptable solutions for the installation of sanitary plumbing installations.

1 _____

2 _____

(2 marks)

Total 5 marks

QUESTION 9

The diagram below shows a foul water installation consisting of four discharge stacks.

Each stack is to have a relief vent fitted. All the relief vents are to discharge through a header vent.

The header vent is to discharge to the stack vent from the 100 mm foul water stack.

The developed length of each relief vent is 16 metres.

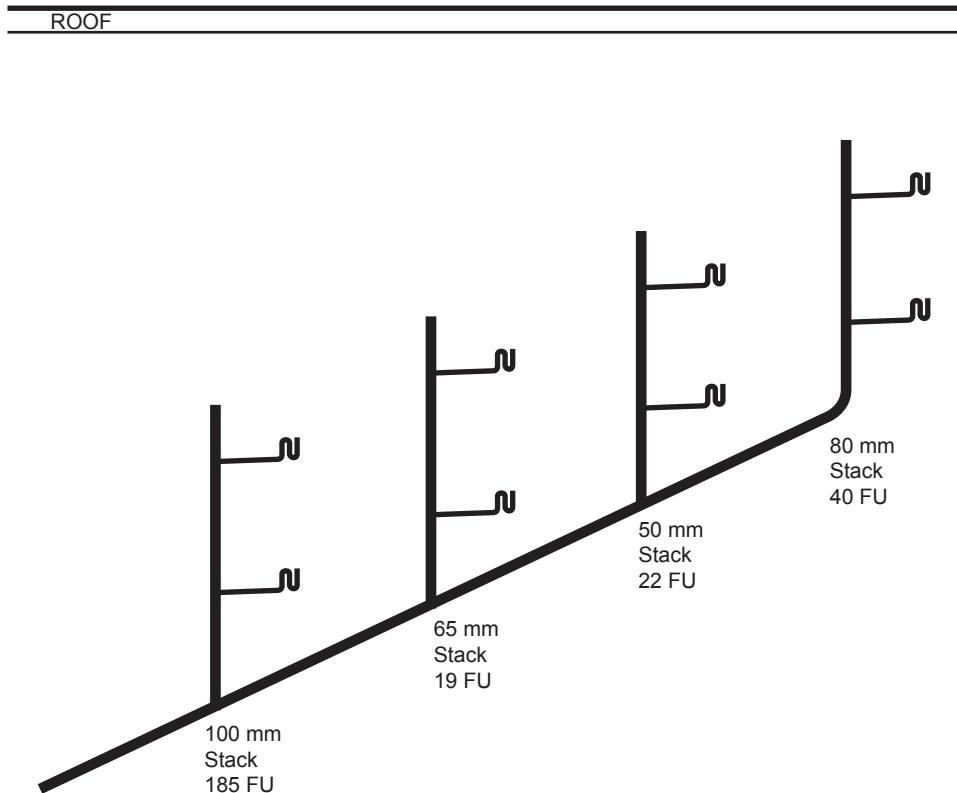
The completed system is to comply with the minimum requirements of AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

(a) Complete the drawing to show the relief vents, header vents and stack vent.

(4 marks)

(b) Using the fixture unit ratings (FU) and stack diameters shown on the diagram, size all the vents. Write your answers on the diagram.

(7 marks)



Total 11 marks

QUESTION 10

(a) Give THREE characteristics of a work site that determine that the site will be deemed to be a confined space.

- 1 _____
- 2 _____
- 3 _____

(3 marks)

(b) Give a situation that would make working in the confined space notifiable.

(1 mark)

Total 4 marks

QUESTION 11

Name THREE types or methods of fire-rating a pipe penetration through a fire-cell wall.

- 1 _____
- 2 _____
- 3 _____

Total 3 marks

QUESTION 12

(a) The Health and Safety at Work Regulations provides for health monitoring of workers.

(i) Give TWO common injuries or hazards in the plumbing industry that may require a worker's health to be monitored.

- 1 _____
- 2 _____

(2 marks)

(ii) If an employee needs to have his/her health monitored, he/she should be given specific information.

Give FOUR of the pieces of information the employee needs to be given.

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

(4 marks)

(b) Give TWO duties a worker has in relation to personal protective equipment.

- 1 _____
- 2 _____

(2 marks)

Total 8 marks

QUESTION 13

The following table lists some plumbing fixtures, fittings or installations requiring backflow protection.

Complete the table by ticking the appropriate boxes to show the cross connection hazard rating of each so that each complies with the minimum requirements of the New Zealand Code clause G12/AS1: Water Supplies.

| Fitting, fixture or installation | High | Medium | Low |
|---|------|--------|-----|
| Carbonated drink dispenser | | | |
| Hair dresser's sink | | | |
| Swimming pool and spa | | | |
| Auxiliary water supply | | | |
| Dentist's spittoon | | | |
| Livestock water supply with added chemicals | | | |
| Boiler, chiller and cooling tower make-up water | | | |
| Pest control equipment | | | |
| Car washing facility | | | |
| Non-carbonated drink dispenser | | | |
| Fire sprinkler system using toxic additives | | | |
| Untreated water storage tank | | | |

Total 6 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. Plumber A has requested the assistance of a licensed plumber employed by Plumber B.

Who is responsible for ensuring that the licensed plumber is capable of completing the proposed work safely?

- A Plumber A.
- B Plumber B.
- C The licensed employee plumber.
- D WorkSafe.
- E The Health and Safety Representative for the site.

2. Which of the following is NOT an acceptable reason to disturb the scene of an accident that has resulted in serious harm?

- A To recover plant and equipment from the site.
- B To save a life.
- C To prevent suffering of an injured person.
- D To maintain public access to services (e.g. gas and electricity).
- E To prevent serious damage to property.

3. WorkSafe must be notified of a serious harm accident as soon as possible by phone or email.

How long from the time of the accident must written notification also be provided?

- A 24 hours.
- B 48 hours.
- C 3 days.
- D 5 days.
- E 7 days.

4. Which of the following must receive a completed notifiable work form before such work is started?

- A The local territorial authority.
- B WorkSafe.
- C The Plumbers, Gasfitters and Drainlayers Board.
- D The Health and Safety Representative for the site.
- E The Regional Health and Safety inspector.

5. How much notice must be given before notifiable work is to be carried out?

- A 24 hours.
- B 48 hours.
- C 72 hours.
- D 5 working days.
- E 10 working days.

6. Under which of the following circumstances can an employee choose not to wear the personal protective equipment gear supplied?

- A When the ambient temperature is above 32°C.
- B When the total weight of the PPE gear exceeds 16 kg.
- C When the employee provides his/her own suitable PPE gear.
- D When it is agreed the PPE gear makes a task more difficult to complete.
- E When the employee signs a waiver safeguarding the employer from prosecution if an injury should occur.

7. Which of the following best describes the term 'eliminate' in relation to hazard management at a worksite?

- A Constructing a barricade around a piece of machinery to prevent workers coming into contact with a hazard.
- B Contracting another company or person to complete a hazardous task.
- C Providing and wearing personal protective equipment to prevent injury.
- D Having a Health and Safety representative assess a task before work commences.
- E Replacing a noisy piece of machinery with a quieter model.

8. Which of the following best describes the term 'minimise' in relation to hazard management at a work site?
- A Constructing a barricade around a piece of machinery to prevent workers coming into contact with a hazard.
 - B Contracting another company or person to complete a hazardous task.
 - C Providing and wearing personal protective equipment to prevent injury.
 - D Having a Health and Safety representative assess a task before work commences.
 - E Replacing a noisy piece of machinery with a quieter model.

9. Which of the following best describes the term 'isolate' in relation to hazard management at a work site?
- A Constructing a barricade around a piece of machinery to prevent workers coming into contact with a hazard.
 - B Contracting another company or person to complete a hazardous task.
 - C Providing and wearing personal protective equipment to prevent injury.
 - D Having a Health and Safety representative assess a task before work commences.
 - E Replacing a noisy piece of machinery with a quieter model.

10. How many seismic restraint straps must be installed on a 350 litre storage hot water cylinder?
- A 2
 - B 3
 - C 4
 - D 5
 - E 6

Total 10 marks

For Examiner's use only

| Question number | Marks | Marks |
|-----------------|-------|-------|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| Section B | | |
| Total | | |