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

CRAFTSMAN EXAMINATION, JUNE 2008
PLUMBING

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 the blank pages at the back of this booklet. Clearly write the question number 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

The following are NOT permitted in the examination room:

Any publications, Acts, Regulations, Codes of Practice, or Standards

Check that this booklet has all of 17 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

QUESTION 1

(a) State FIVE categories of people who are permitted to do sanitary plumbing under the Plumbers Gasfitters and Drainlayers Act.

1 _____

_____

2 _____

_____

3 _____

_____

4 _____

_____

5 _____

_____

(5 marks) ☐

(b) The New Zealand Building Code and the compliance document G12 Water Supplies contain a set of four objectives in relation to the installation of water supplies.

State these FOUR objectives.

1 _____

_____

2 _____

_____

3 _____

_____

4 _____

_____

(4 marks) ☐

Total 9 marks ☐

QUESTION 2

The diagram opposite shows a cross-sectional view of a high rise building. Water supply systems within the building are to be designed.

On the diagram, draw and label all pipework and associated components. Include

• a ground floor storage water tank to supply all water to the building

• separate systems of potable and non-potable water from staged (break) tanks

• staged (break) tanks that supply four floors

• a pneumatic booster to supply fire hose reels on each floor

• backflow prevention devices.

Note: Show only the termination points on each floor and not the connections to individual fittings and fixtures.

Total 14 marks

QUESTION 2 (cont'd)

QUESTION 3

List SIX aspects that should be considered in the installation of a pump for supplying water to ensure trouble-free operation. Assume that the pump is the correct one for the job and that there is an adequate supply of water from below the level of the pump inlet.

1 _____

_____

2 _____

_____

3 _____

_____

4 _____

_____

5 _____

_____

6 _____

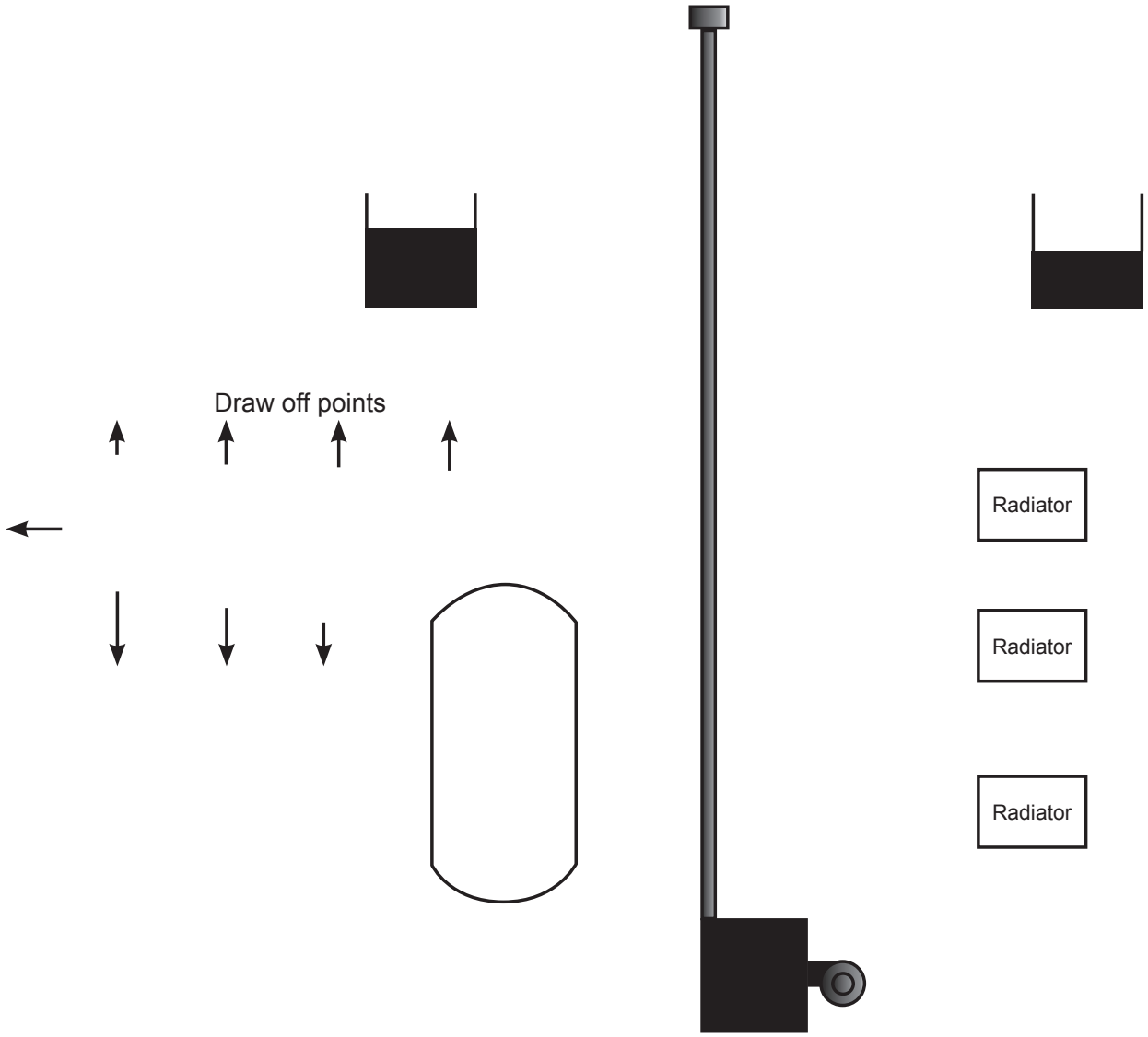
_____

Total 6 marks ☐

QUESTION 4

The starter drawing below shows an indirect combined flow and return potable domestic hot water supply system and a heating system.

On the diagram, draw and label all the pipework and valves necessary in the design of the systems. Include drain points, and show the position of the circulating pumps on the secondary hot water supply circuit and the heating circuit. Do not show tempering or radiator control valves.



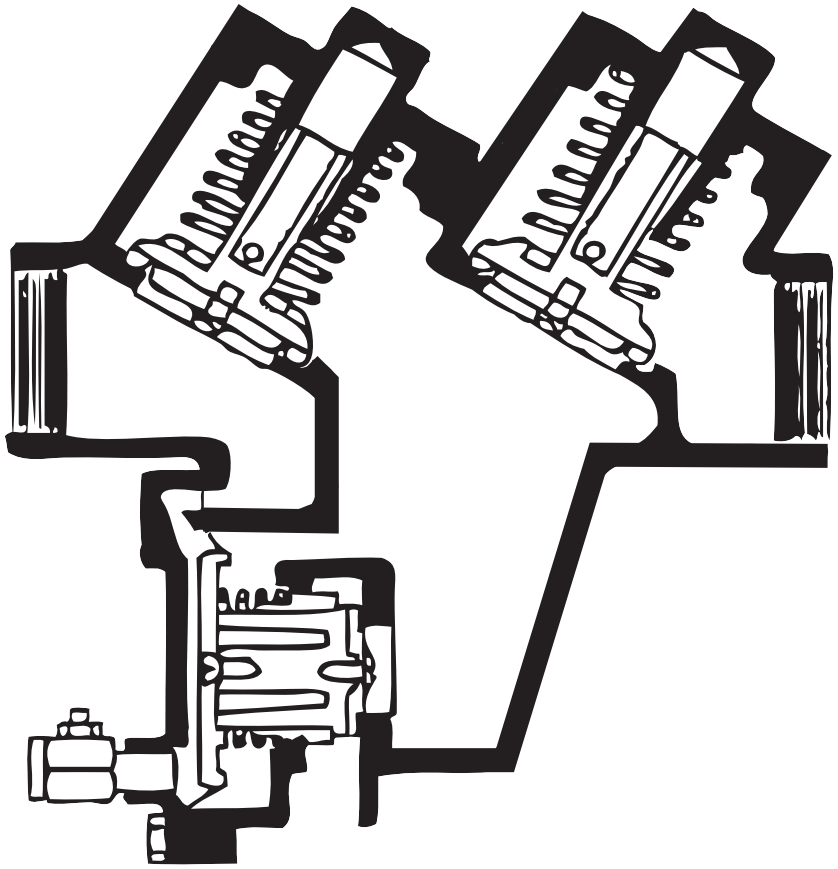
Total 16 marks

QUESTION 5

(a) Name the valve shown in the diagram below.

_____

(1 mark)



QUESTION 5 (cont'd)

(b) Explain how the valve in (a) operates under each of the following conditions.

(i) Normal operation.

(ii) No flow.

(iii) Back-siphonage.

(iv) Backpressure.

(8 marks)

QUESTION 5 (cont'd)

(c) The valve shown in (a) is to be installed within the confines of a building envelope.

State SIX factors that must be considered when deciding where to locate the valve.

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

(3 marks)

Total 12 marks

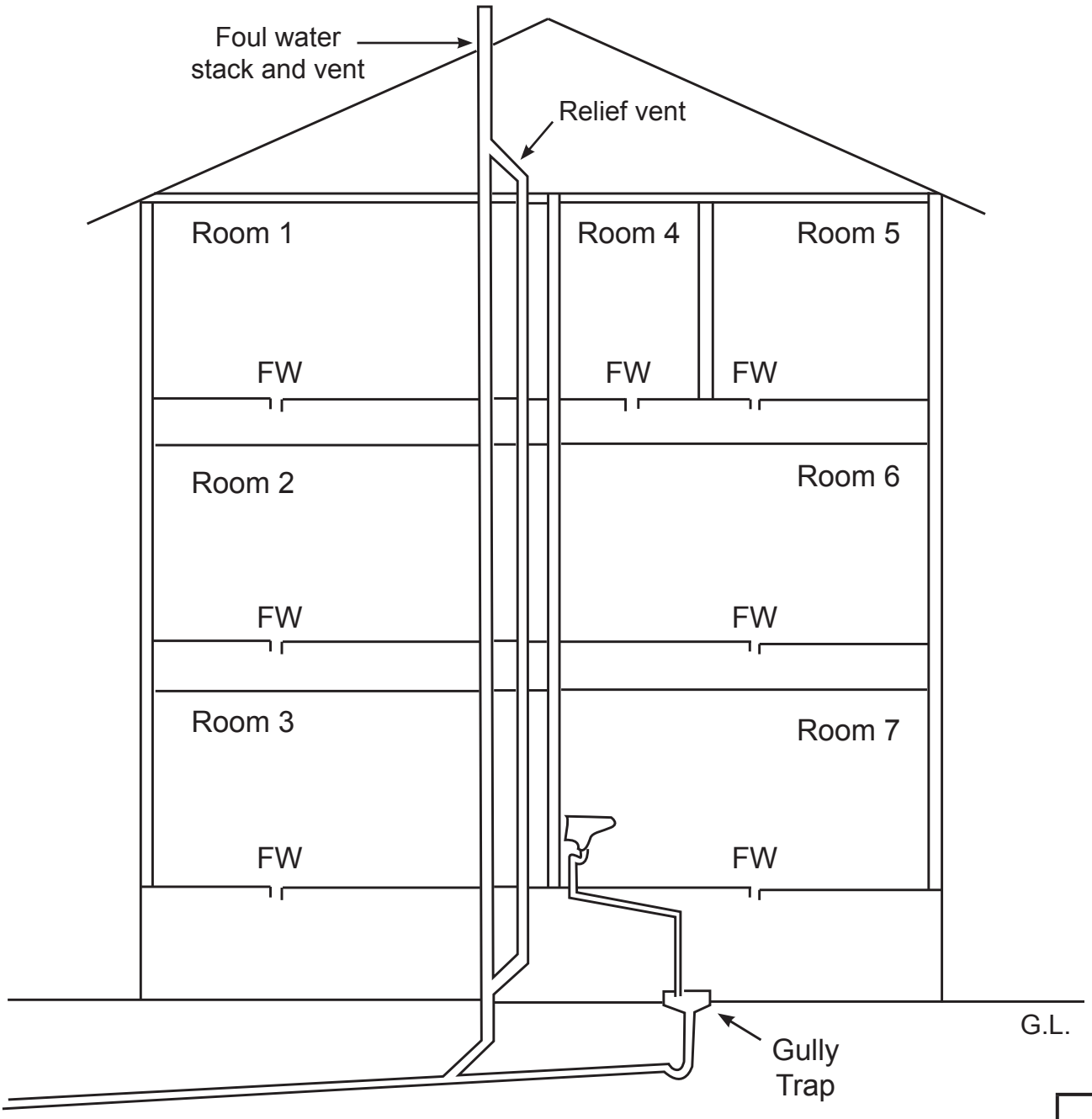
QUESTION 6

The diagram below shows a cross-sectional elevation of a three storey building.

Rooms 1, 2 and 3 may be subject to accidental overflow or spillage from sanitary fittings. Rooms 4, 5, 6 and 7 are subject to floor washing on a regular basis.

Floor wastes are to be installed in all rooms in compliance with the New Zealand Building Code clause G13/AS1.

Complete the cross-sectional elevation by drawing in all the floor waste pipe-work and termination points, and show the minimum pipe sizes required.



Total 8 marks

QUESTION 7

A three storey building requires hot water to be delivered for personal hygiene while maintaining the circulating temperature at 75°C.

On the starter drawing opposite and using a ruler, draw a mains pressure re-circulating hot water system for the building. All pipe work is to remain within the pipe ducts except for that in the plant room (cylinders).

Include

• the layout of the cold water supply pipe work and associated valving

• the backflow valves for containment on the water supply inlet

• hot water flow and return pipe work

• the position of the circulating pump and associated valving

• isolating valves

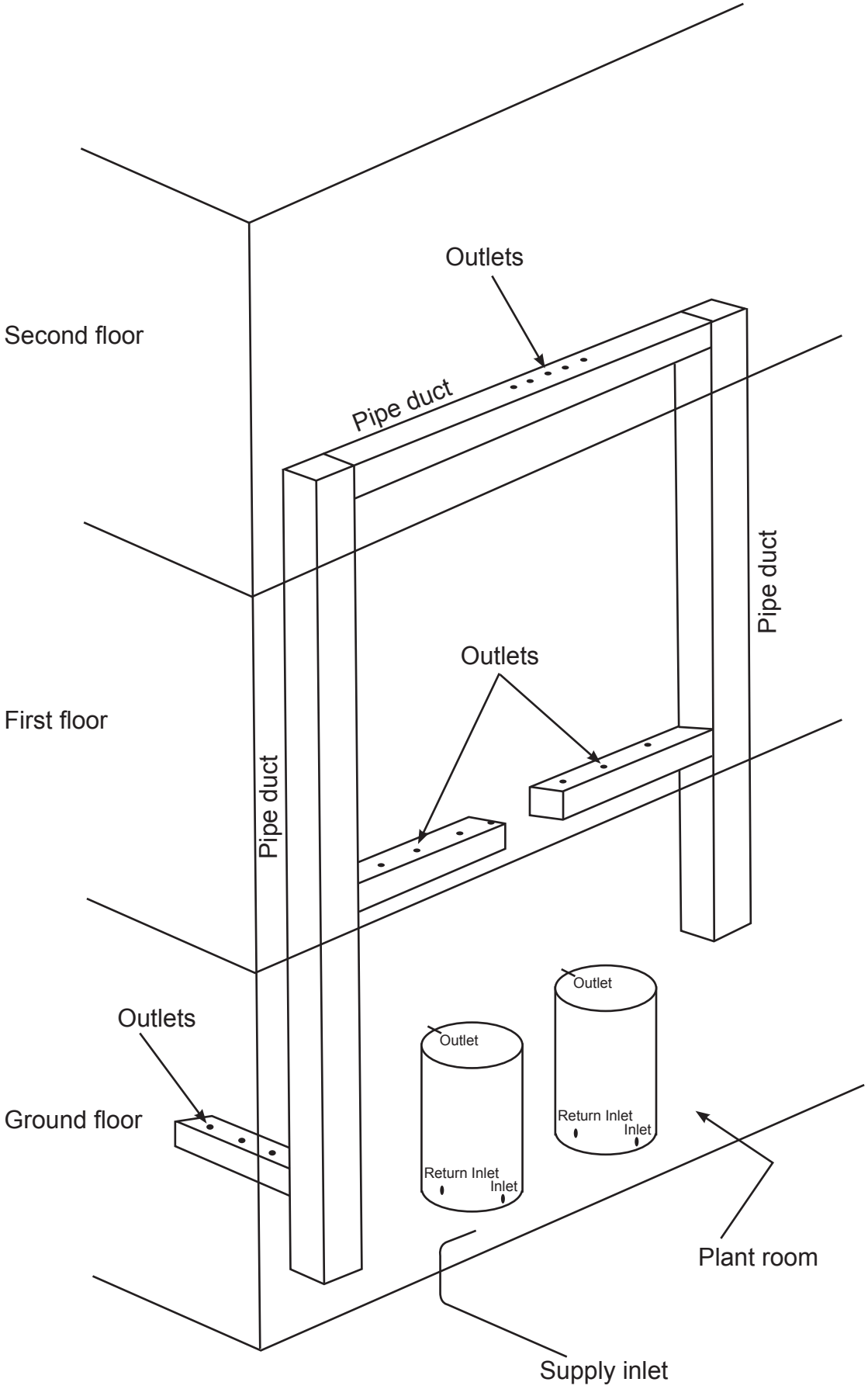
• tempering valves.

Show only the cold water supply pipework necessary for the installation of the tempering valves and hot water cylinders. No other cold water pipework is to be shown.

Only the pipework and valves specified above are to be shown.

Total 12 marks

QUESTION 7 (cont'd)



QUESTION 8

The starter drawing opposite shows the layout of sanitary fittings within a three storey building.

On the diagram, and using the tables below, draw and size all foul water and ventilation pipework for the foul water system for the building. All pipework sizes and gradients are to be the minimum to comply with New Zealand Building Code G13/AS1. No air admittance valves are to be used. All foul water pipework is to terminate at the three points shown.

Table 2: Fixture Discharge Pipe Sizes and Discharge Units

Sanitary fixture or appliance	Discharge units	Minimum trap and discharge pipe diameter (mm)
Basin	1	32
Bath (with or without overhead shower)	4	40
Urinal (bowl type)	1	32
Kitchen sink	3	40
Water closet pan	4	80

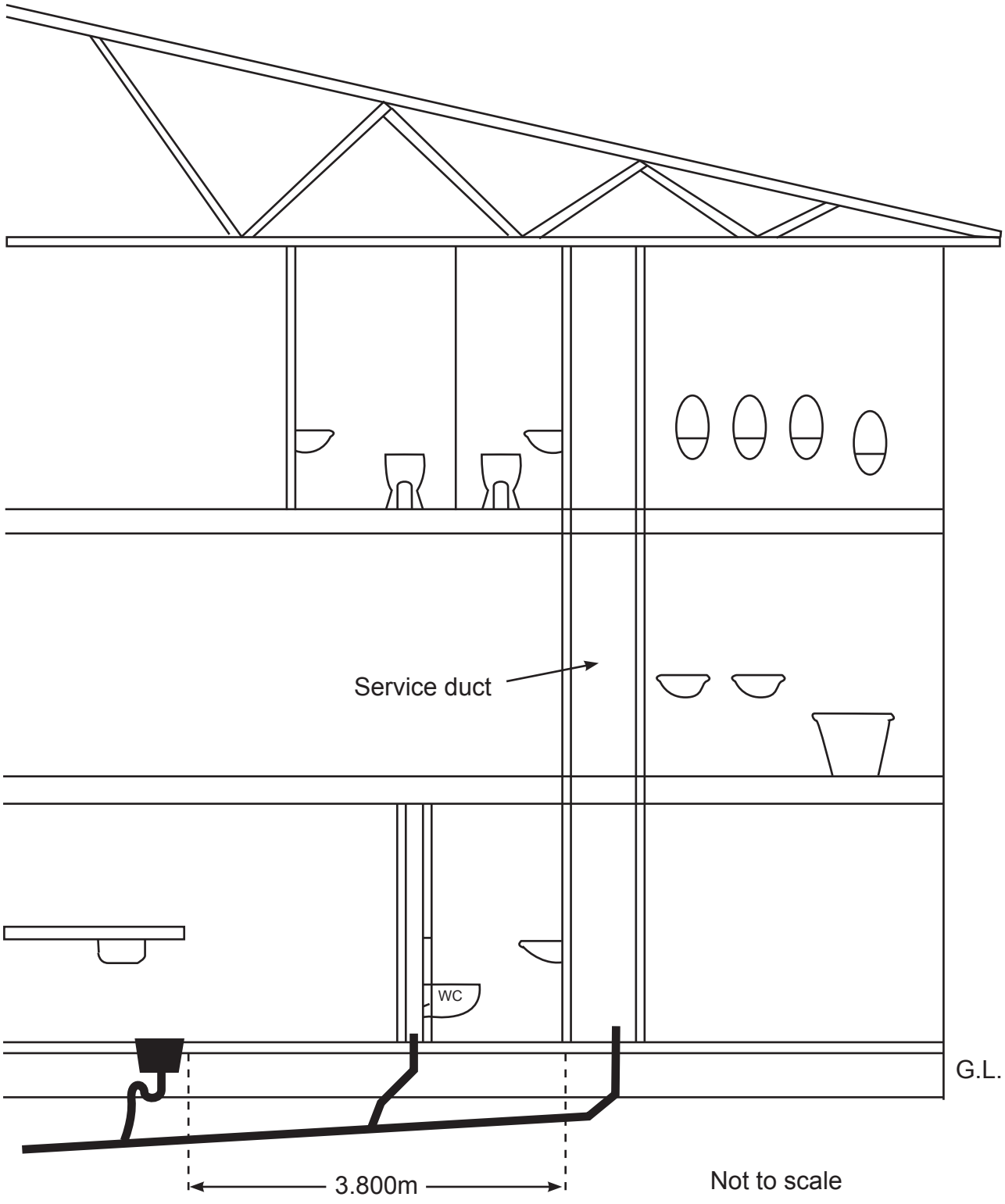
Table 4: Discharge Unit Loading for Stacks and Graded Discharge Pipes

Diameter (mm)	Maximum discharge from any one floor	Vertical stack	Graded discharge pipes				
			Minimum gradient				
			1:20	1:30	1:40	1:50	1:60
32	1	1	1				
40	2	6	6	5	4		
50	5	15	15	10	8		
65	6	18	51	29	21		
80	13	40	65	39	27	20	16
100	65	195	376	248	182	142	115

Table 6: Vent Pipe Sizes

For fixture vent pipes	
Diameter of fixture discharge pipe (mm)	Minimum diameter of fixture vent pipe (mm)
32	32
40	32
50	40
65	40
80	40
100	40
For branch vent, branch drain vent, relief vent and discharge stack vent pipes	
Maximum discharge units connected to the discharge pipe	Minimum diameter of open vent pipe (mm)
Up to 15	40
16 to 65	50

QUESTION 8 (cont'd)



Total 20 marks

QUESTION 9

The following diagram shows a plan view of a warehouse roof with an internal gutter. The roof has a pitch of 22.5°.

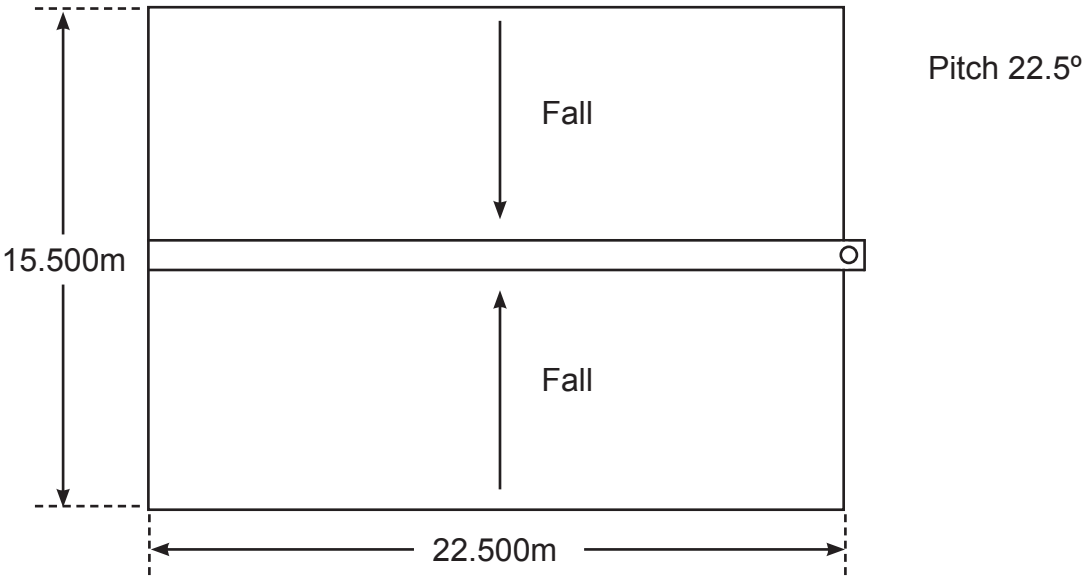
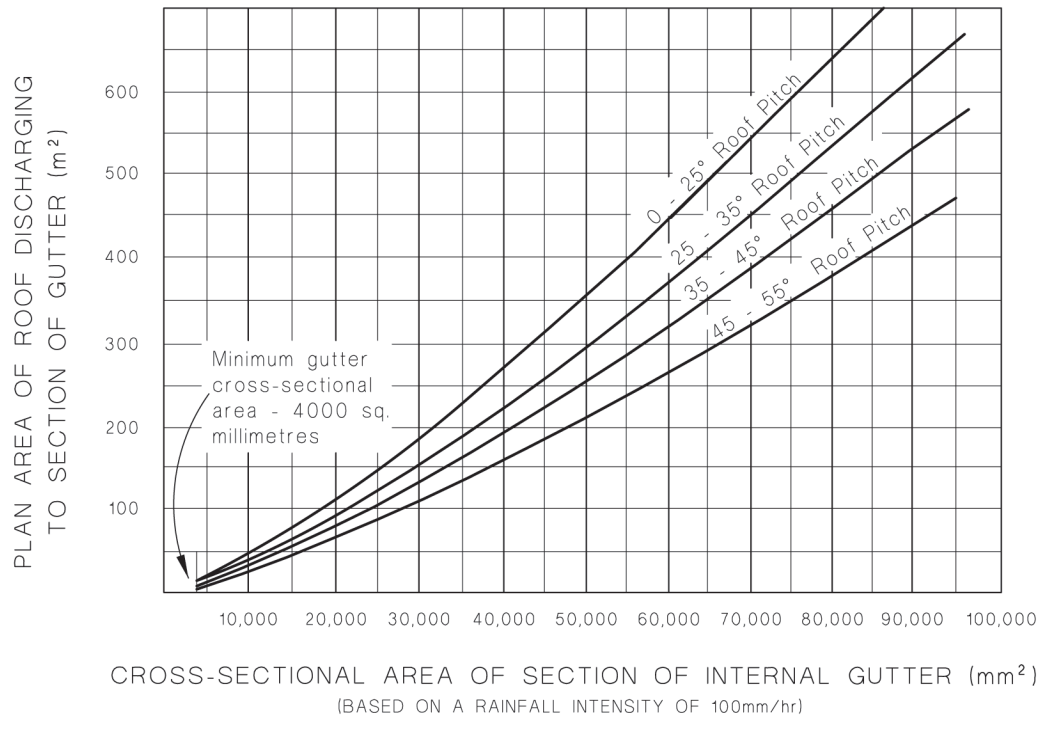


Figure 16: **Cross-sectional Area of Internal Gutter**



QUESTION 9 (cont'd)

(a) Using Figure 16 on the page opposite, find the minimum cross-sectional area of the internal gutter. Base your answer on a rainfall intensity of 100mm/hr.

(2 marks)

(b) Using table 5 below, find the size of round down pipe required for the gutter in (a).

Table 5: Downpipe Sizes for Given Roof Pitch and Area

Downpipe size (mm) (minimum internal sizes)	**Roof pitch**			
	0-25º	**25-35º**	**35-45º**	**45-55º**
	Plan area of roof served by the downpipe (m^2)			
63 mm diameter	60	50	40	35
74 mm diameter	85	70	60	50
100 mm diameter	155	130	110	90
150 mm diameter	350	290	250	200
65 x 50 rectangular	60	50	40	35
100 x 50 rectangular	100	80	70	60
75 x 75 rectangular	110	90	80	65
100 x 75 rectangular	150	120	105	90

(1 mark)

Total 3 marks

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Question number _____

This page is available for additional working or answers

Question number _____

For Examiner's use only

Question number	Marks	Marks
1		
2		
3		
4		
5		
6		
7		
8		
9		
Total		