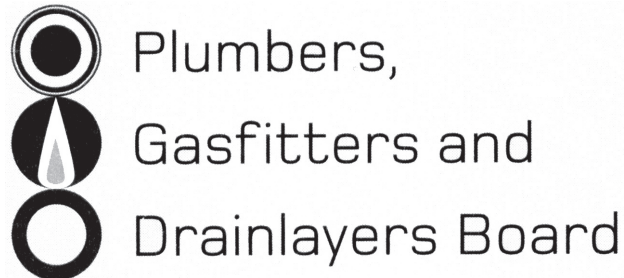


Affix label with Candidate Code  
Number here.  
If no label, enter candidate  
Number if known

.....

No. 9197



## REGISTRATION EXAMINATION, NOVEMBER 2009

### **DRAINLAYING**

#### 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 23–25 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

#### **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 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**



## QUESTION 1

- (a) AS/NZS 3500 Part 2: Sanitary plumbing and drainage states that all products used in sanitary drainage installations must be selected to ensure satisfactory service for the life of the installation.

Give FOUR factors that may be taken into account in this selection.

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

(4 marks)

- (b) Solvent welding is a common method of jointing uPVC drainage materials.

Explain the principle of this process.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(2 marks)

- (c) An excavation machine has dug a trench for a drainage system deeper than required.

State TWO ways in which the base of the trench can be prepared for laying the drainage system.

1 \_\_\_\_\_  
\_\_\_\_\_  
2 \_\_\_\_\_  
\_\_\_\_\_

(2 marks)

**Total 8 marks**

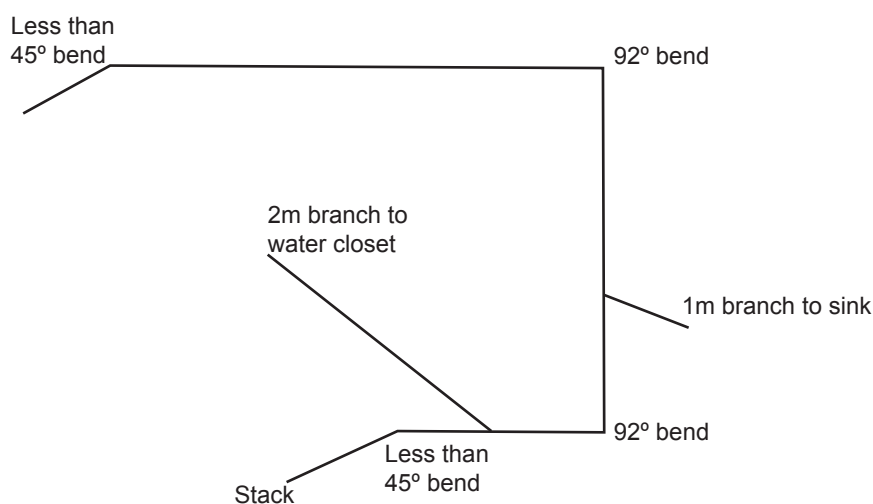
## QUESTION 2

- (a) The drawing below shows a plan of a foul water drainage system.

The plan does not include inspections.

No allowance is to be made for fittings at the ends of lines.

- (i) On the diagram, show all inspections to meet the minimum requirements of AS/NZS 3500 Part 2: Sanitary plumbing and drainage.



- (ii) The table below provides additional information for costing this system.

Complete the table of costings for the job.

Materials	Rate	Quantity	Cost
Drainage pipe	\$36.50/m	75m	
Inspection fittings	\$48.00 each		
Plain fittings	\$21.50 each		
Sub total			
Profit margin	17%		
Sub total			
GST cost	12.5%		
Total cost			

(4 marks)

**QUESTION 2 (cont'd)**

(b) A 110mm uPVC drain 48.500m long is to be laid to a grade of 1.65%.

Calculate the fall of the drain in mm. Show all working.

---

---

(1 mark)

**Total 5 marks**

### QUESTION 3

The diagram opposite shows a plan view of a domestic dwelling on a building site.

The foul water system is to connect to the foul water sewer connection.

The storm water system is to connect to the stormwater sewer connection.

The foul water drainage system is to comply with AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

The stormwater drainage system is to comply with AS/NZS 3500 Part 3: Stormwater drainage.

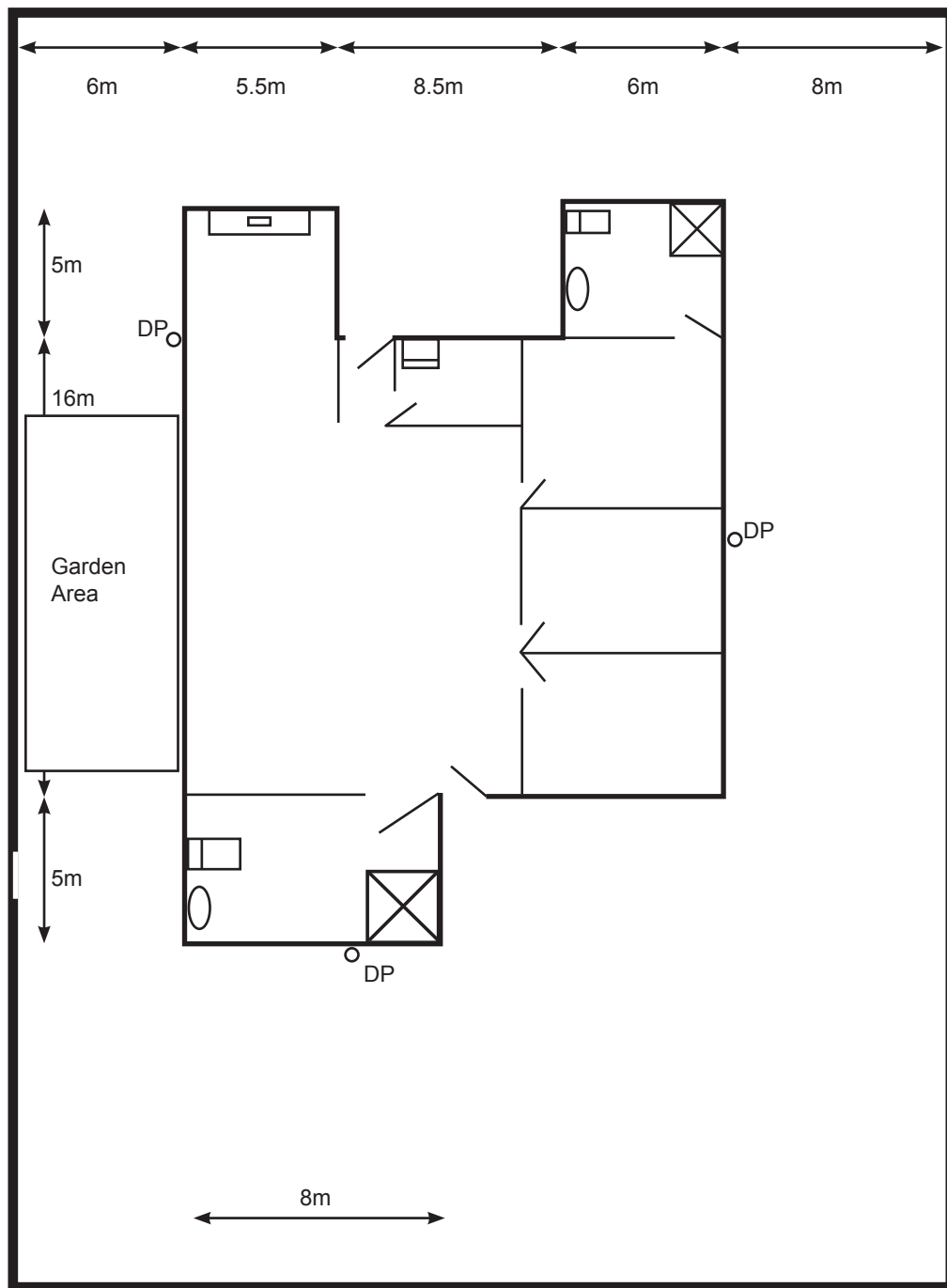
All foul water and stormwater drainage is to be installed exterior to the building envelope.

Sanitary fixtures are to be connected individually to the drainage system.

No foul water or storm water drainage is to be laid through the garden.

On the plan, draw and label the foul water and stormwater drainage systems. The systems are to include all pipe work, bends, junctions, fittings, inspections, ventilation and any other components needed to comply with the minimum requirements of the standards.

### QUESTION 3 (cont'd)



Foul water sewer connection →

Stormwater sewer connection →

Key	
WC	
Sink	
Basin	
Tub	
Shower	
Downpipe	

Total 7 marks

## QUESTION 4

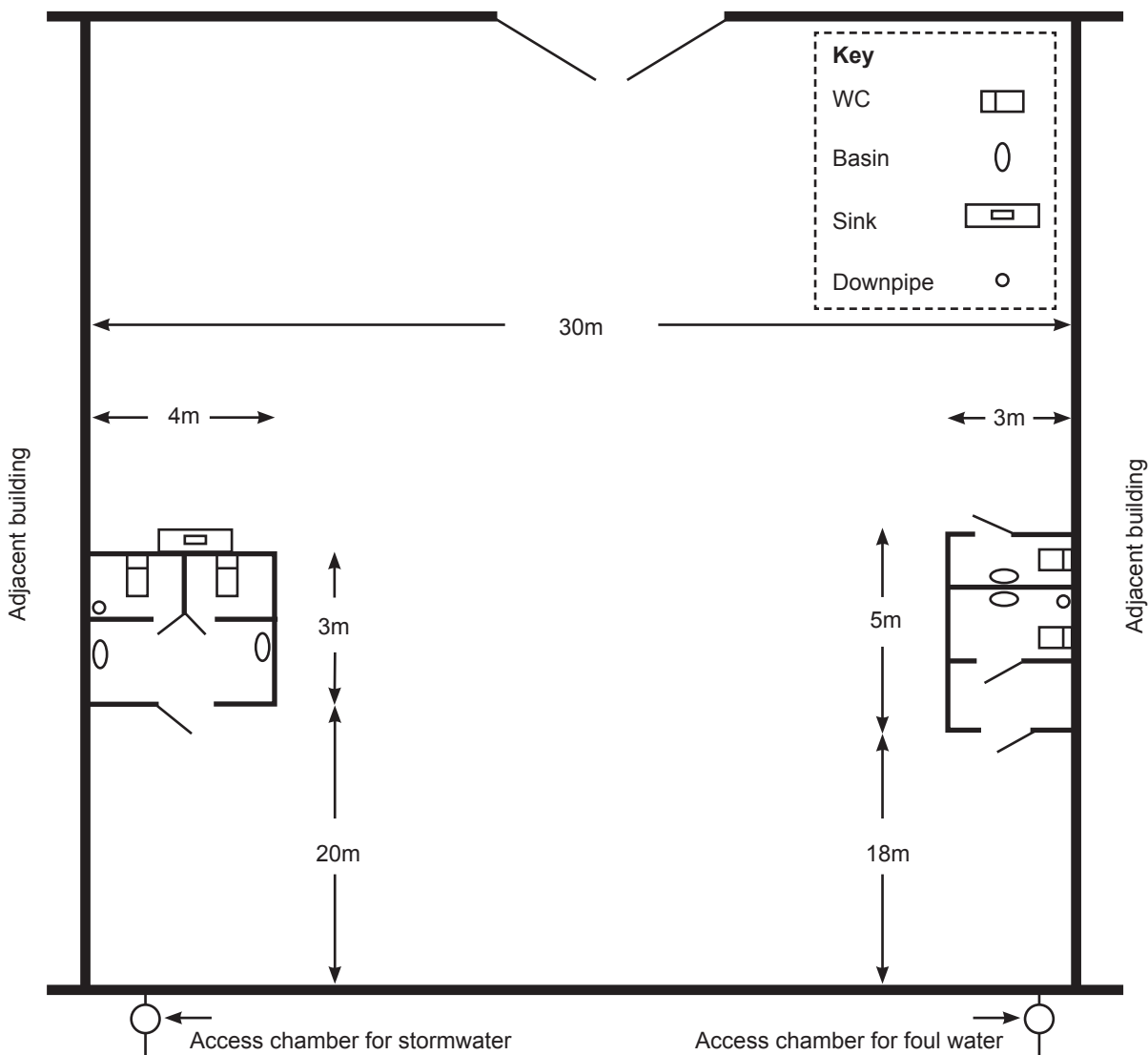
The diagram below shows a storage facility with a concrete floor.

A drain is to be laid below the concrete floor within the building envelope.

Foul water drainage is to discharge to the access chamber for foul water, and is to comply with the minimum requirements of AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

Stormwater drainage is to discharge to the access chamber for stormwater, and is to comply with the minimum requirements of AS/NZS 3500 Part 3: Stormwater drainage.

On the plan, draw and label the foul water and stormwater drainage systems. The systems are to include all pipe work, bends, junctions, chambers, fittings, inspections, ventilation and any other components needed to comply with the minimum requirements of the standards.



Total 6 marks



## QUESTION 5

- (a) (i) New Zealand Building Code Clause G13 /AS2 specifies that inspection points must be fitted to an external grease trap.

State where the inspection points must be located.

---

(1 mark)

☐

- (ii) New Zealand Building Code Clause G13/AS2 states that a gully dish must be as close as possible to a grease trap.

State the maximum allowable distance between a gully dish and a grease trap.

---

(1 mark)

☐

- (iii) A concrete storm water silt trap is to be constructed.

In the design, the outlet is situated part way up the side wall of the trap and not at the base of the trap.

Give the TWO reasons for this.

1 

---

2 

---

(2 marks)

☐

- (iv) AS/NZS 3500 Part 3 Stormwater drainage includes the draining away of ground water and/or surface water in the vicinity of buildings.

Give THREE benefits achieved by this draining away.

1 

---

---

2 

---

---

3 

---

---

(3 marks)

☐

### QUESTION 5 (cont'd)

- (b) A long length of uPVC foul water drainage pipe is to be joined to a socketed fitting.

The method of joining is to be rubber ring.

List, in order, the steps to be followed in making this joint.

---

---

---

---

---

---

---

---

---

(3 marks)

- (c) (i) When a drain passes through a concrete foundation, it must have clearance all round.

State the minimum clearance.

---

(1 mark)

- (ii) In the laying of a drain, lateral support is important.

State how this is achieved and what situation it prevents.

---

---

(2 marks)

### QUESTION 5 (cont'd)

- (iii) A drainlayer may install a disconnecter gully within the confines of a building envelope provided certain specific requirements are met.

Give THREE of these requirements.

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

(3 marks) ☐

- (d) AS/NZS 3500 Part 2: Sanitary plumbing and drainage specifies the minimum depth of cover for drains.

Drains having less than the minimum cover as specified must be covered by at least 50mm of overlay and then paved.

- (i) State what such drains must be paved with.

\_\_\_\_\_

(½ mark) ☐

- (ii) State the minimum thickness of paving that must be laid when the drains are subject to heavy vehicular traffic.

\_\_\_\_\_

(½ mark) ☐

- (iii) State the minimum thickness of paving that must be laid when the drains are subject to light vehicular traffic.

\_\_\_\_\_

(½ mark) ☐

- (iv) State the minimum thickness of paving that must be laid when the drains are not subject to vehicular traffic.

\_\_\_\_\_

(½ mark) ☐

**Total 18 marks** ☐

## QUESTION 6

The diagram opposite shows a plan view of a domestic dwelling on a building site. Contour lines are also shown.

Foul water is to connect to the foul water sewer connection.

The stormwater system is to discharge at the roadside kerb.

Household stormwater is to discharge into a retention tank that is to be situated inside the boundary. The stormwater is then to discharge to the roadside kerb.







The foul water drainage system is to comply with AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

The storm water drainage system is to comply with AS/NZS 3500 Part 3: Storm water drainage.

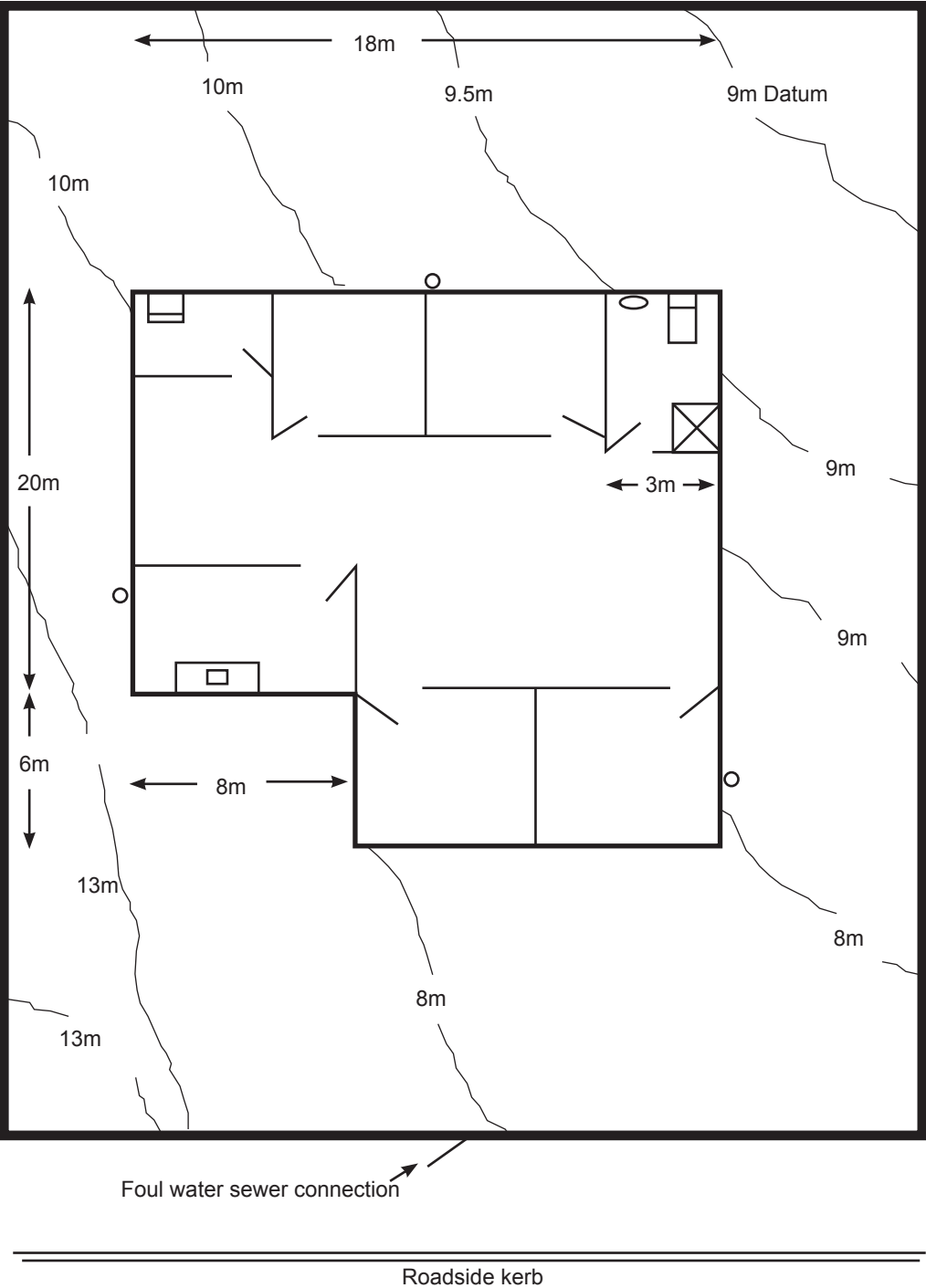
All foul water and storm water drainage is to be installed exterior to the building envelope.

Sanitary fixtures are to be connected individually to the drainage system.

On the plan, draw and label the foul water and storm water drainage systems. The systems are to include all pipe work, bends, junctions, fittings, inspections, ventilation, tank and any other components needed to comply with the minimum requirements of the standards.

Key	
Basin	
Tub	
Shower	
WC	
Sink	
Down pipe	

QUESTION 6 (cont'd)



Total 6 marks

## QUESTION 7

The drawing opposite shows a plan view of a block of shops. Each shop backs onto a lightwell. Access to the lightwell is through shop 2.

Shop 1: Clothing shop  
Shop 2: Footwear  
Shop 3: Plastic products  
Shop 4: Hair salon  
Shop 5: Restaurant  
Shop 6: Stationery

Foul water and storm water drainage is to be installed immediately after the foundations have been completed and prior to erection of the building. This will enable the lightwell area to be sealed prior to construction of the building.

All drainage systems are to stop at the building envelope. A contract plumber will install the foul water system within the building envelope at a later date.

Floor waste gullies will not be used within the building envelope.

All foul water branches from sanitary fixtures are to join a main drain independently.

The main foul water drain line from the shops is to pass beneath the building and to terminate at the Territorial Authority foul water connection.





The foul water and storm water drainage systems are to include pipe work, bends, junctions, fittings, inspections, ventilation, traps, sumps and any other relevant components in compliance with the standards specified below.

The lightwell surface is to slope towards the sump.

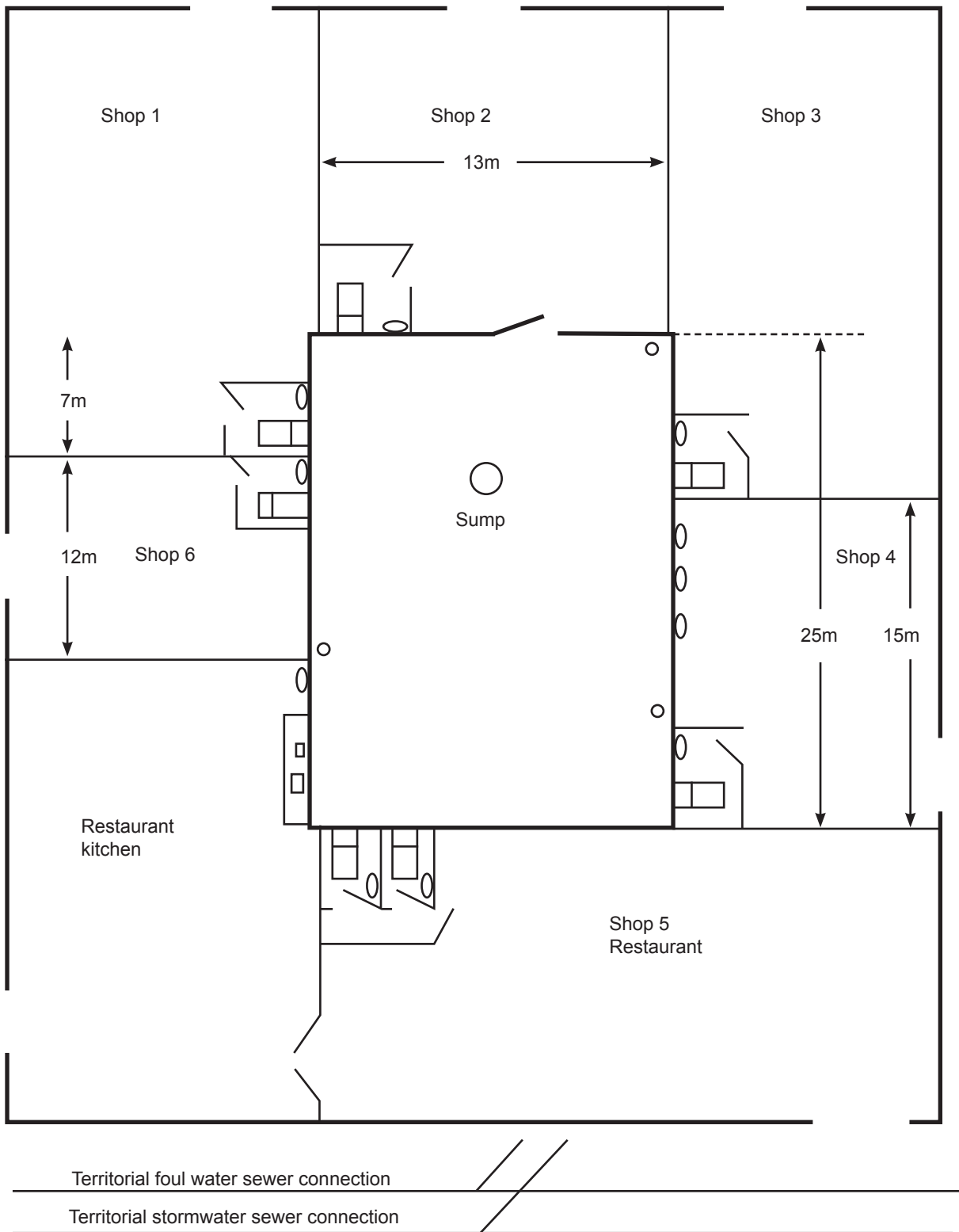
All storm water drainage lines from the downpipes are to fall to the sump.

The storm water drain from the sump is to pass across the lightwell area and beneath the building to terminate at the Territorial Authority stormwater connection.

- (a) Using your knowledge of AS/NZS 3500 Part 2: Sanitary plumbing and drainage, draw and label the foul water drainage systems to meet the minimum requirements of this standard.
- (b) Using your knowledge of AS/NZS 3500 Part 3: Storm water drainage, draw and label the storm water system to meet the minimum requirements of this standard.

Key	
Sink	
Basin	
WC	
Down pipe	

**QUESTION 7 (cont'd)**



**Total 7 marks**

## QUESTION 8

- (a) A trench is to be excavated for laying a foul water drainage system.

The base of the trench will be adjacent to and below the level of a building foundation.

- (i) Based on your understanding of New Zealand Building Code Clause G13/AS2, state the requirement regarding the minimum separation between the trench and the foundation.

---

---

(2 marks)

- (ii) If the trench is to be open for longer than 48 hours, state the change to the minimum separation between trench and foundation that must be achieved.

---

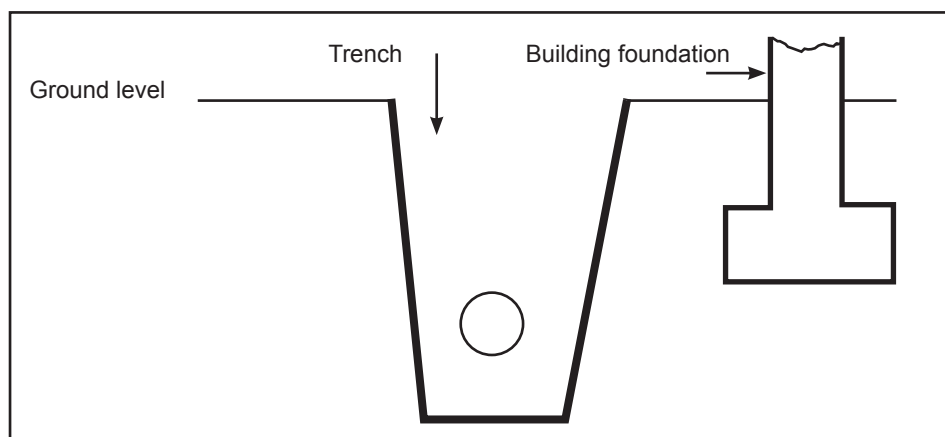
(1 mark)

- (iii) If the trench is closer to the foundation than the minimum allowable distance, state what must be obtained and when it must be obtained.

---

(1 mark)

- (iv) Complete the starter drawing below to show where the minimum measurements in (i) and (ii) are taken from.



(2 mark)

### QUESTION 8 (cont'd)

(b) When working below ground, there is a potential danger from gases.

(i) Explain why some gases may accumulate in the trench.

\_\_\_\_\_

(1 mark)

☐

(ii) Gas detection equipment should be capable of monitoring different groups of gases.

List THREE such groups.

1 \_\_\_\_\_

2 \_\_\_\_\_

3 \_\_\_\_\_

(3 marks)

☐

(c) (i) Sketch a side elevation showing a typical connection of a vent to a drain so that it is compliant with AS/NZS 3500 Part 2: Sanitary plumbing and drainage. Show the ground level.

(ii) Show the minimum size of the drain and the vent.

(2 marks)

☐

### QUESTION 8 (cont'd)

(d) Answer the following questions using your knowledge of AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

(i) State the maximum allowable length of an unvented foul water branch drain.

---

(1 mark)

(ii) A 100mm branch drain has three water closet pans discharging into it.

State where on the drain the vent must be located.

---

(1 mark)

**Total 14 marks**

## QUESTION 9

- (a) (i) The Employment Relations Act makes provision for personal grievance procedures.

Give FIVE grounds for a personal grievance to be taken.

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

(5 marks)

- (ii) State the period within which a personal grievance must be raised with an employer.

\_\_\_\_\_

(1 mark)

- (iii) If a personal grievance cannot be resolved with an employer, state the means of redress that an employee has.

\_\_\_\_\_

\_\_\_\_\_

(1 mark)

- (b) “Acceptable Solutions” and “Verification Methods” are defined in the Building Act.

Give the meaning of these terms.

Acceptable solutions:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Verification methods:

\_\_\_\_\_

(4 marks)

**Total 11 marks**

## QUESTION 10

The drawing opposite shows a plan view of the outline of a domestic dwelling on a building site.

Foul water drainage is to discharge to a standard septic tank.

Effluent disposal requires two 20m effluent lines.

The datum on the south east corner is 15m.

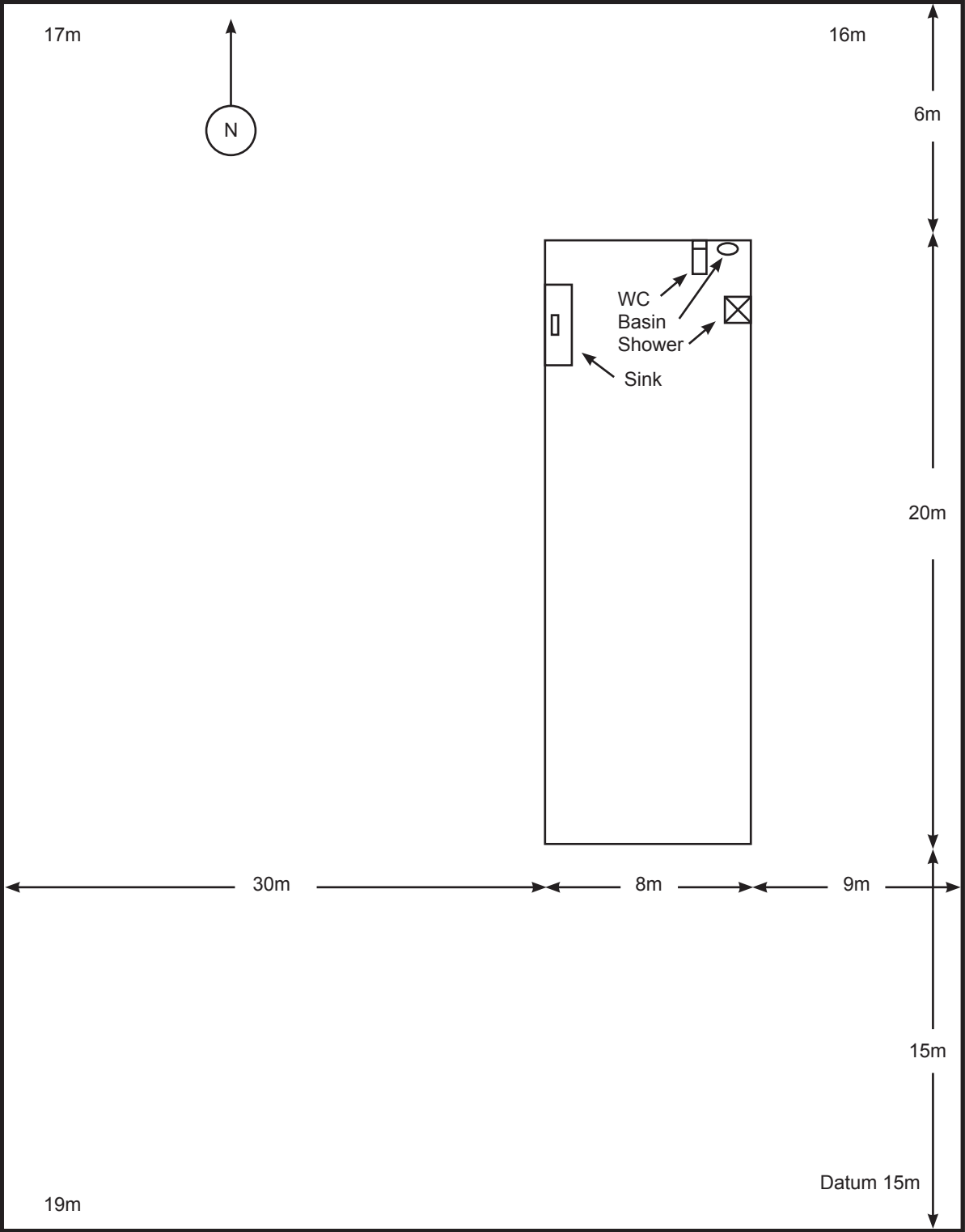
Other datum points and measurements are as shown.

All drainage is to be exterior to the building envelope.

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

Draw and label the drainage system. Show all pipe work, effluent lines, bends, junctions, fittings, inspections, tank, ventilation and any other components.

QUESTION 10 (cont'd)



Total 6 marks

## QUESTION 11

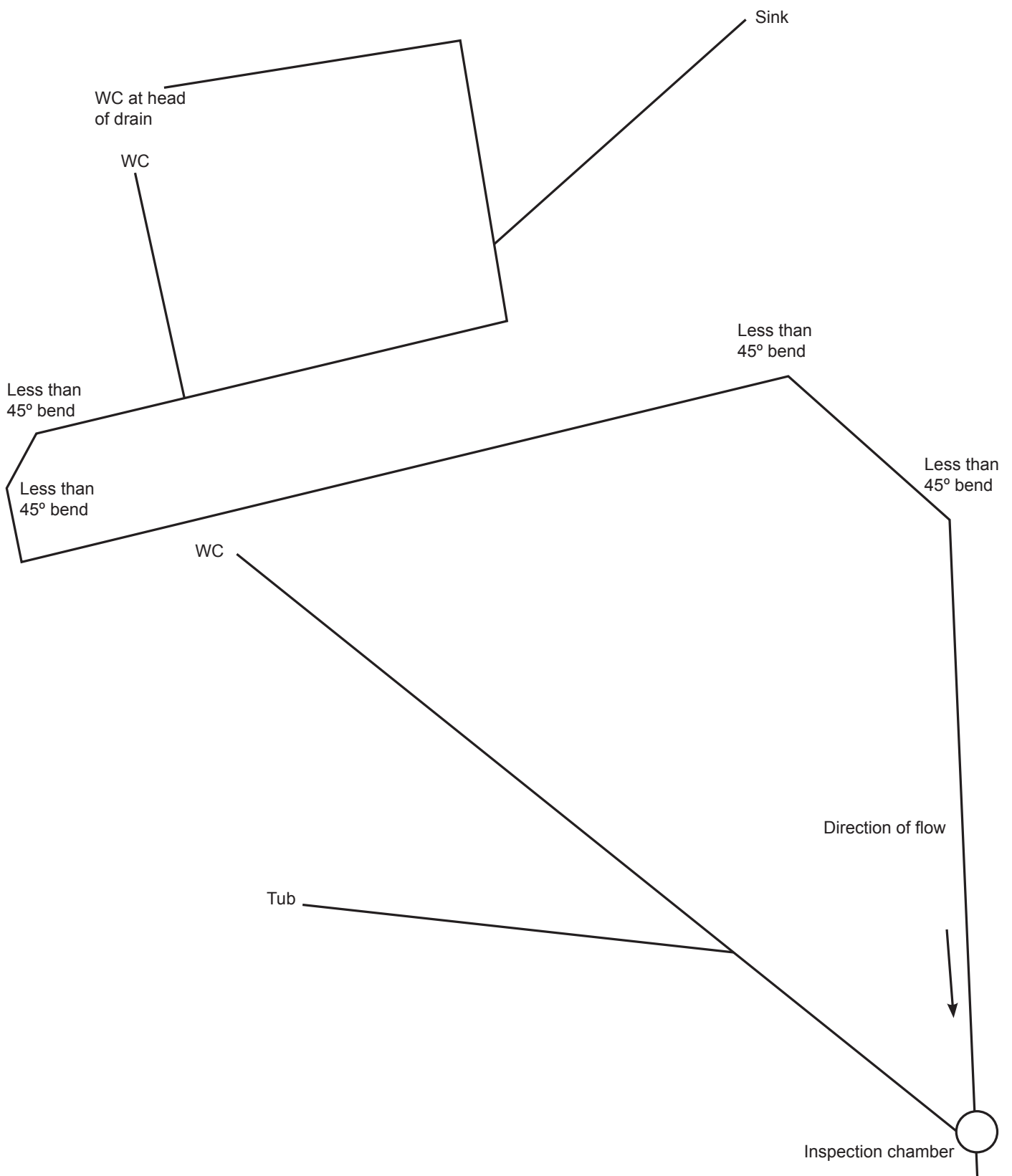
The diagram on the opposite page shows a plan view of the layout of a foul water drainage system.

The diagram is drawn to a scale of 1:100.

The foul water drainage system is to comply with AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

Based on your knowledge of this standard and using the scale given, complete the drawing to show and label all ventilation, inspections, gullies and chambers to meet the minimum requirements of the standard.

## QUESTION 11 (cont'd)



Total 4 marks



## QUESTION 12

- (a) In some situations, effluent disposal from a septic tank cannot be achieved by conventional soakage.

Describe THREE alternative methods of achieving the effluent disposal.

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

(6 marks)

- (b) State the type of cast iron drains that are outside the scope of drainlaying under the Plumbers, Gasfitters and Drainlayers Act.

\_\_\_\_\_

(1 mark)

- (c) State TWO requirements that must be met by foul water drainage when forming a joint at an access chamber.

- 1 \_\_\_\_\_  
2 \_\_\_\_\_

(1 mark)

**Total 8 marks**

This page is available for additional working or answers

Question number \_\_\_\_\_

[illegible]

This page is available for additional working or answers

Question number \_\_\_\_\_

[illegible]

This page is available for additional working or answers

Question number \_\_\_\_\_

[illegible]

For Examiner's use only

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