

Affix label with Candidate Code  
Number here.  
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Number if known

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No. 9197



Plumbers,  
Gasfitters and  
Drainlayers Board

## REGISTRATION EXAMINATION, JUNE 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 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 29 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) A drainlayer may be required to work within a confined space. Before entering a confined space it is essential that the space be made safe. Answer the following with regard to safety.

(i) List FOUR unsafe conditions in regard to atmospheric conditions that may need to be remedied before entering a confined space.

1 \_\_\_\_\_

2 \_\_\_\_\_

3 \_\_\_\_\_

4 \_\_\_\_\_

(2 marks)

(ii) A fall hazard exists in a confined space. List the safety equipment, excluding personal protection equipment (PPE), that must be worn before entering this space.

\_\_\_\_\_

(1 mark)

(b) Isolating transformers and residual current devices (RCDs), if used correctly, reduce the likelihood of being electrocuted.

(i) A power lead is connected to a double insulated drill. State where the RCD should be connected.

\_\_\_\_\_

(1 mark)

(ii) Often it is necessary to run two power leads from the one RCD. State where the leads must be connected to the RCD.

\_\_\_\_\_

(1 mark)

**Total 5 marks**

## QUESTION 2

- (a) Drains may be joined at grade to each other by means of a swept junction or an oblique junction fitting.

Based on your knowledge of AS/NZS 3500 Part 2: Sanitary plumbing and drainage, answer the following questions.

- (i) State the direction in which all junctions must be swept.

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- (ii) State what type of junction must not be used on the horizontal plane.

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- (iii) If unequal junctions are used, state the position of the soffit of the branch drain in relation to the soffit of the pipe to which it connects.

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- (iv) State what must not be joined to junctions installed on the vertical plane.

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(4 marks)

**QUESTION 2 (cont'd)**

- (b) (i) Drain vents are an integral part of a drainage system. In this regard answer the following questions.

List FOUR adverse effects on the drainage system that could result from inadequate ventilation.

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

(2 marks)

- (ii) Give TWO separate purposes of a drain vent.

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

(1 mark)

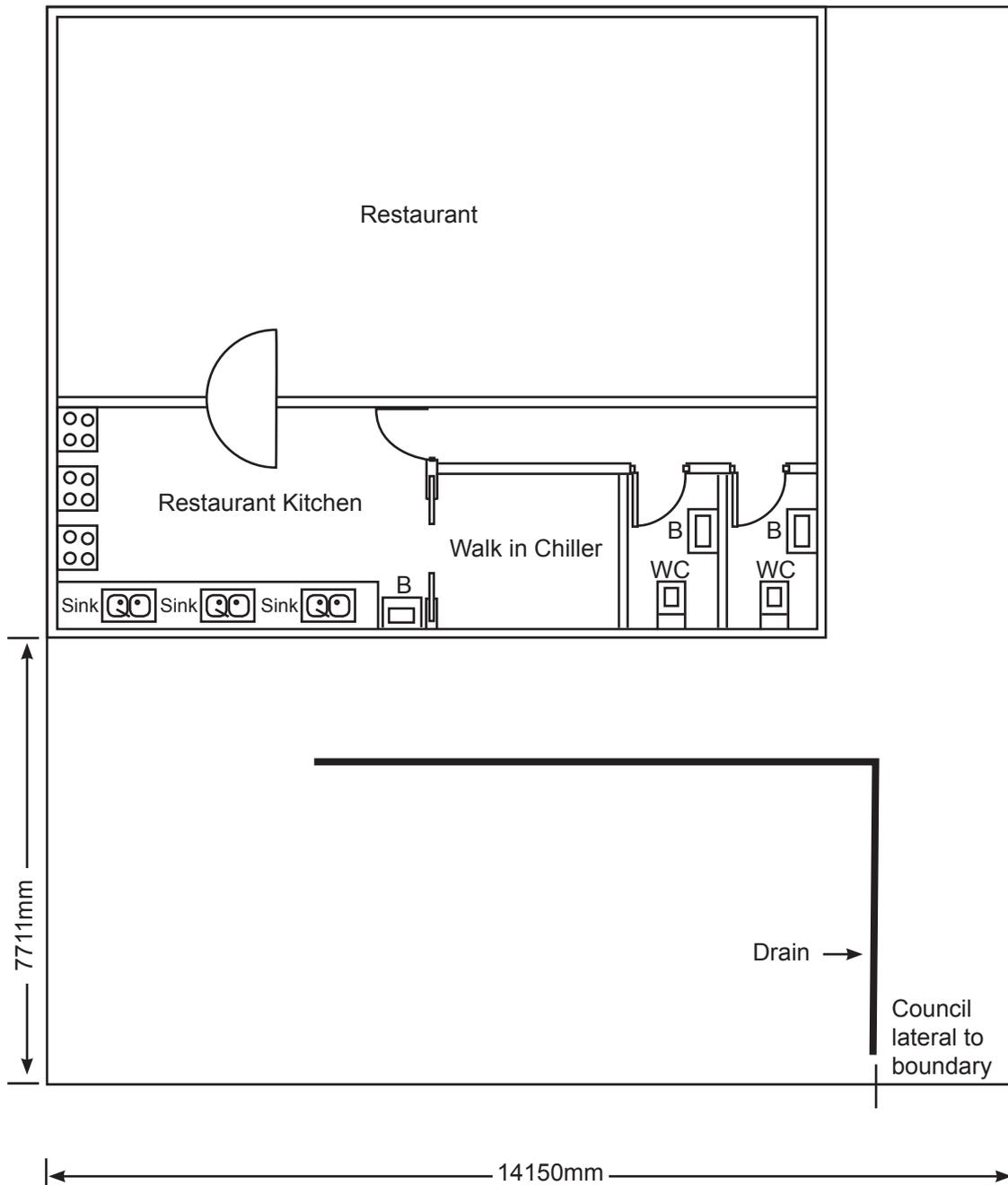
**Total 7 marks**

### QUESTION 3

A plan view of a building site showing a section of drainage is drawn below.

All drainage is to be exterior to the building envelope.

Based on your knowledge of New Zealand Building Code Clause G13/AS2 Foul Water, complete the foul water drainage system, and label all the components.



Total 4 marks



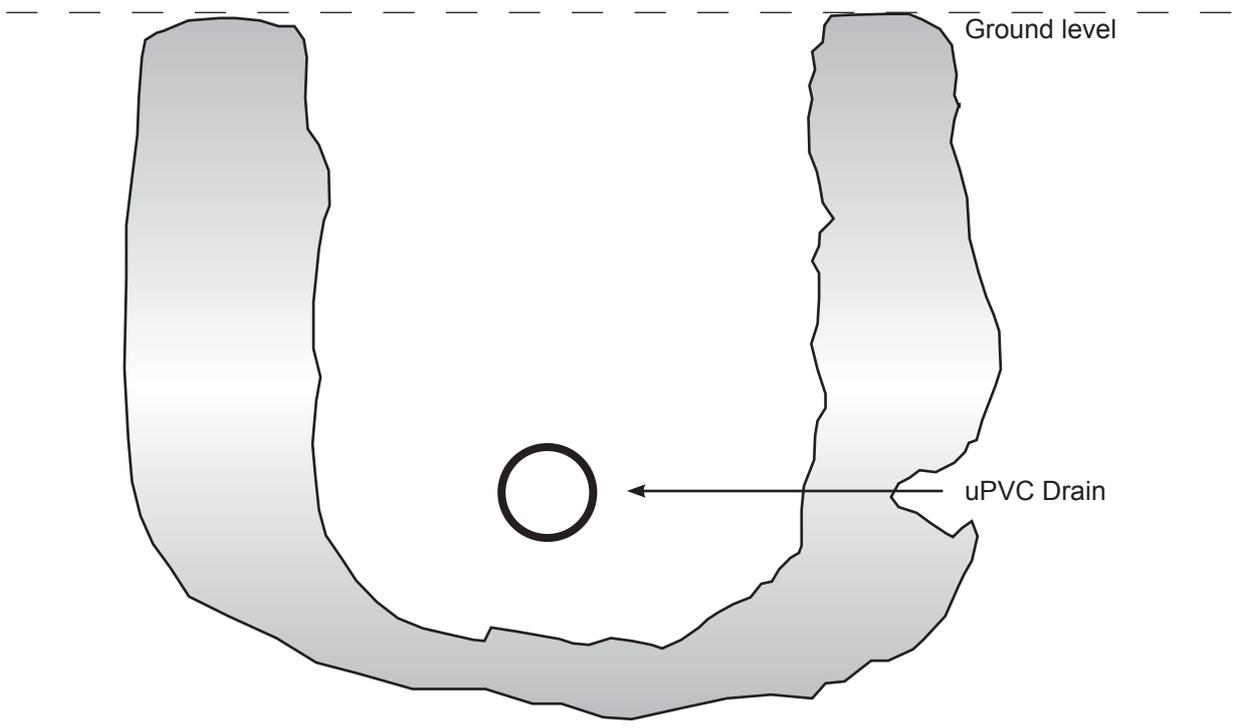
**QUESTION 4**

- (a) The starter drawing below shows a cross-sectional view of a uPVC foul water drain laid in ground.

Complete the drawing to clearly show all relevant features for a completed installation.

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

Show and label all relevant layers, and show all measurements including the minimum trench width.



(4 marks)

- (b) State the purpose of an absorption test (percolation test) and state what type of system it is used for.

Purpose: \_\_\_\_\_  
\_\_\_\_\_

System: \_\_\_\_\_

(2 marks)

**Total 6 marks**

### QUESTION 5

The drawing below shows a plan view of a domestic dwelling.

Foul water drainage is to be through a standard septic tank.

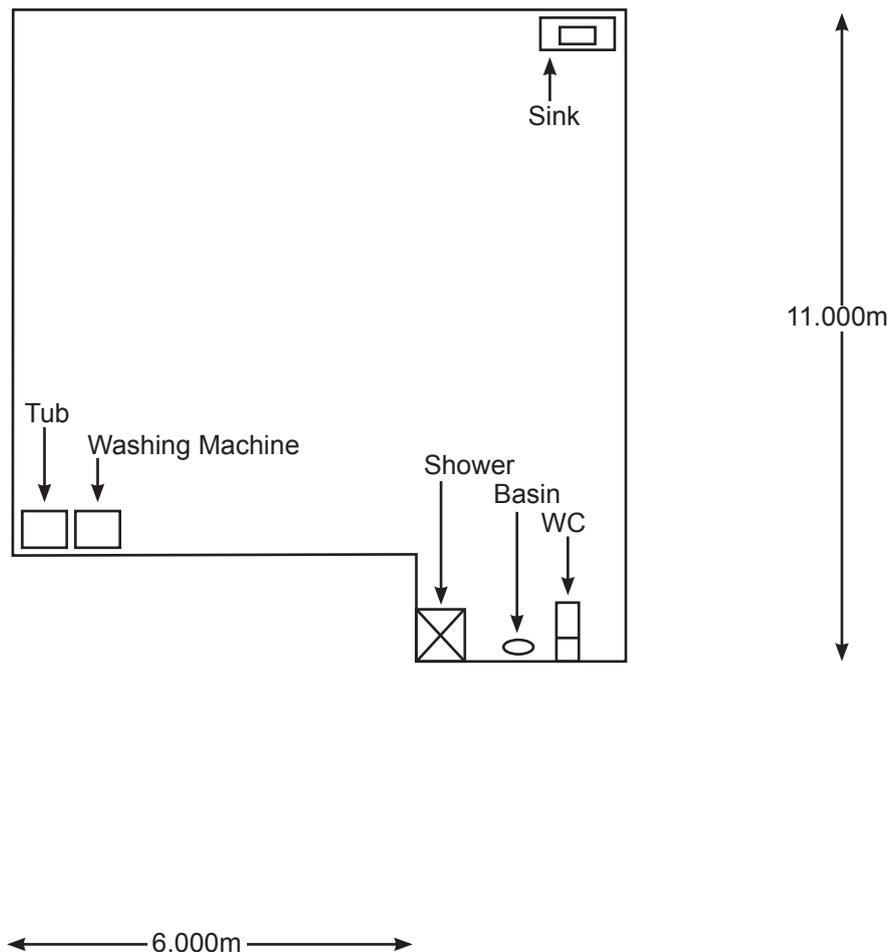
Effluent disposal is to be through a common effluent drain.

Waste fixtures are to discharge through a sullage tank to the common effluent drain, except for the sink which is to discharge into the septic tank.

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

All drainage is to be exterior to the building envelope.

Draw and label the drainage systems. Show all pipework, effluent lines, bends, junctions, fittings, inspections, tanks, ventilation and any other components.



Total 8 marks

## QUESTION 6

Gully traps are an integral part of a drainage system. Using your knowledge of the New Zealand Building Code Clause G13/AS2 Foul Water, answer the following questions.

(a) State the TWO things that gully traps are constructed to prevent.

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

(1 mark)

(b) State where the waste pipe outlets entering a gully must be located, and give the relevant measurements.

\_\_\_\_\_

\_\_\_\_\_

(1 mark)

(c) In order to provide overflow relief for housing, a gully trap must be positioned so that the top of the gully dish is a minimum measurement below the overflow level of the lowest sanitary fixture served by the drainage system.

State this minimum measurement.

\_\_\_\_\_

(1 mark)

(d) State what the grating must allow for.

\_\_\_\_\_

(1 mark)

(e) State where on a building used for housing at least one gully trap must be positioned, excluding within the confines of the property.

\_\_\_\_\_

(1 mark)

**Total 5 marks**

## QUESTION 7

- (a) An excavation for a trench is to be carried out.

The excavated trench is to be 212m long and 350mm wide, and is to have a depth of 750mm at the top end and 1900mm at the lower end.

The excavated material is to be removed by trucks.

Each truck has the capability to hold 3.4 cubic metres of excavated material.

Dumping fees are \$223.00 per load or part load for each truck inclusive of GST.

The depth of granular base course material is to be 250mm along the full length and width of the excavation.

The cost of granular base course material is \$44.50 per cubic metre inclusive of GST.

Show all working in each question.

- (i) Calculate quantity of excavated material to be removed.

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- (ii) Calculate the total cost of dumping fees.

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- (iii) Calculate the number of cubic metres of granular base course material required.

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- (iv) Calculate the cost of the granular base course material.

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- (v) Calculate the total cost of excavated spoil removal and granular base course material.

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(3 marks)

**QUESTION 7 (cont'd)**

(b) The drawing below represents a drainage profile.

The drain length from the head of drain to outlet of access chamber is 29m. This drain is laid to a grade of 1.65% (1 in 60).

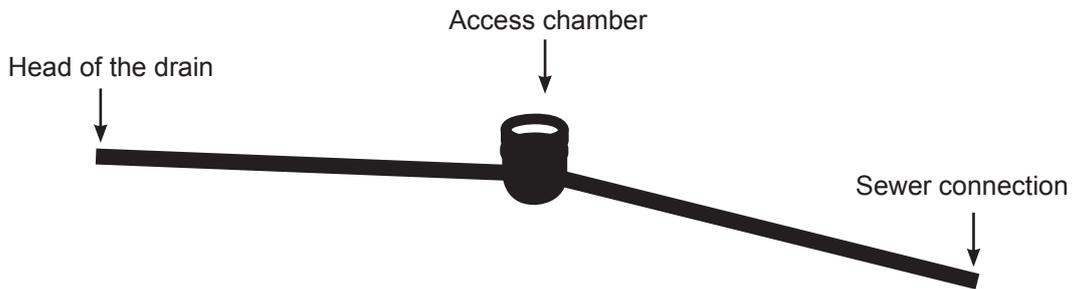
The drain length from the access chamber to the sewer connection is 27.5m. This drain is laid to a grade of 2.5% (1 in 40).

Calculate, in metres to three decimal places, the total fall between the head of the drain and the sewer connection.

Show all working.

Formula:

$$\text{Fall} = \frac{\text{length}}{\text{grade}}$$



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(2 marks)

**Total 5 marks**

## QUESTION 8

The drawing opposite shows the plan of a house on a building site.

The foul water drainage is to connect to the council sewer on the south boundary.

Ground level at the northwest corner of the building is 12.000m.

Ground level at the northeast corner of the building is 12.500m.

Ground level at the southeast corner of the building line is 11.500m.

The invert level at the sewer connection is 13.500m.

All levels are taken from the given Datum (15.000m).

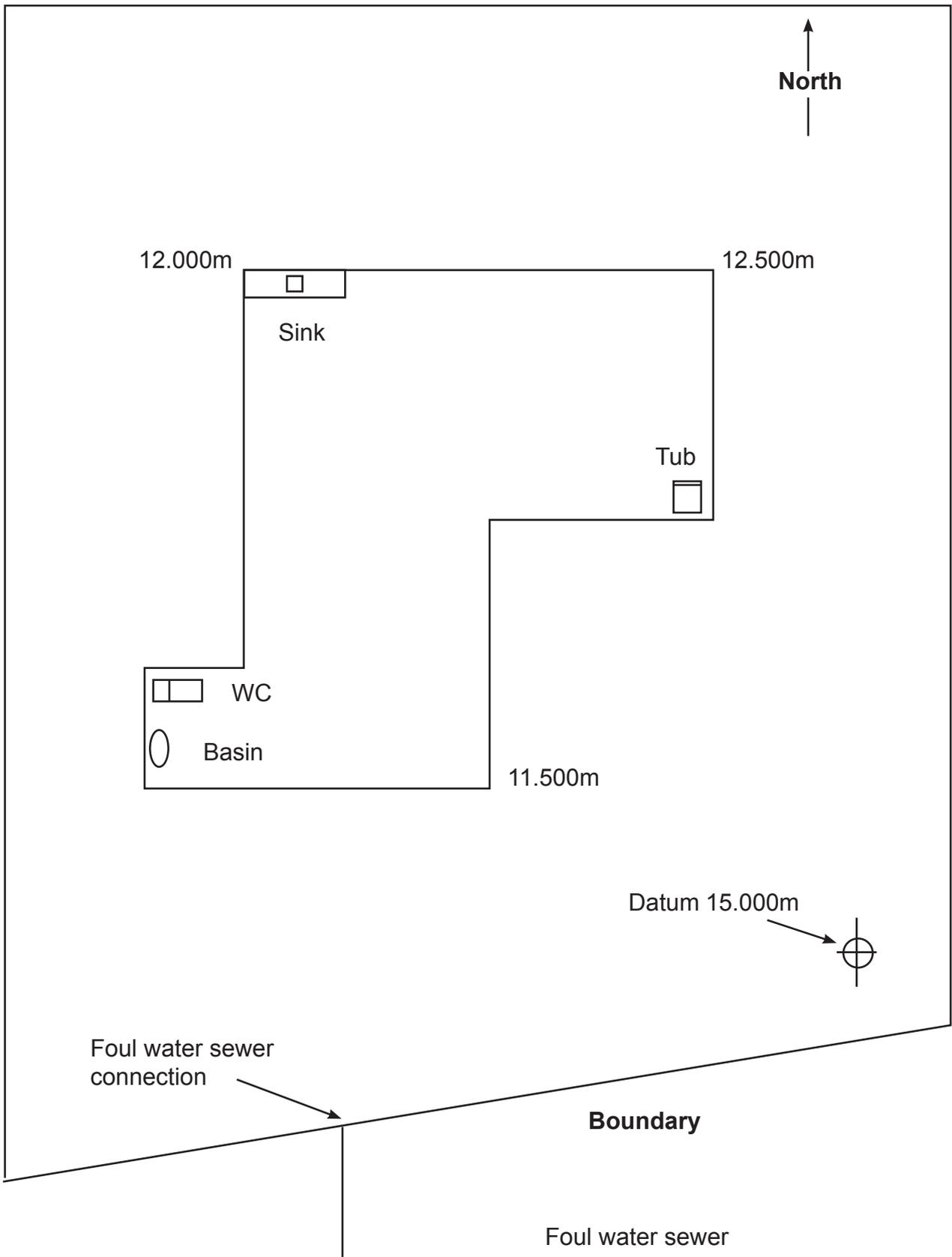
The drainage system is to comply with AS/NZS 3500 Part 2: Sanitary plumbing and drainage.

Foul water drainage is to be installed exterior to the building.

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

Draw and label a complete foul water drainage system including all bends, junctions, inspections, chambers, ventilation, access points and any other relevant components.

QUESTION 8 (cont'd)



Total 6 marks

**QUESTION 9**

A trench 1800mm deep is to be excavated for laying a drainage system.

The excavated spoil is to be placed beside the trench.

(a) A safety checklist is to be prepared regarding the excavated spoil. List THREE items the checklist should include.

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

(1½ marks)

(b) List THREE safety measures to be taken regarding worker access to the trench.

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

(1½ marks)

**QUESTION 9 (cont'd)**

(c) List THREE things that should be done to prevent persons falling into the trench during the hours of darkness.

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

(1½ marks)

(d) State what must be located before commencing excavation on a site.

- \_\_\_\_\_
- \_\_\_\_\_

(½ mark)

**Total 5 marks**

## QUESTION 10

The drawing opposite shows a block of shops backing onto a common courtyard.

All drainage systems are to stop at the building line.

A contract plumber will install the foul water system within the building envelope later.

No floor waste gullies are to be used within the building envelope.

Shops 1 to 4 inclusive have individual shop leases. Foul water branches from the shops are to join a main drain individually.

The main foul water drain line from shops 1 to 4 inclusive and ablution rooms A and B is to terminate at access chamber 1.

Foul water drainage from ablution blocks A and B is to combine with a single branch to the main drain.

Foul water drainage from shops 7-8 and ablution block 9 is to join a second main drain line, which will also terminate at access chamber 1.

- (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.

The foul water drainage systems are to include pipework, bends, junctions, fittings, inspections, ventilation, traps and any other relevant components in compliance with the standard.

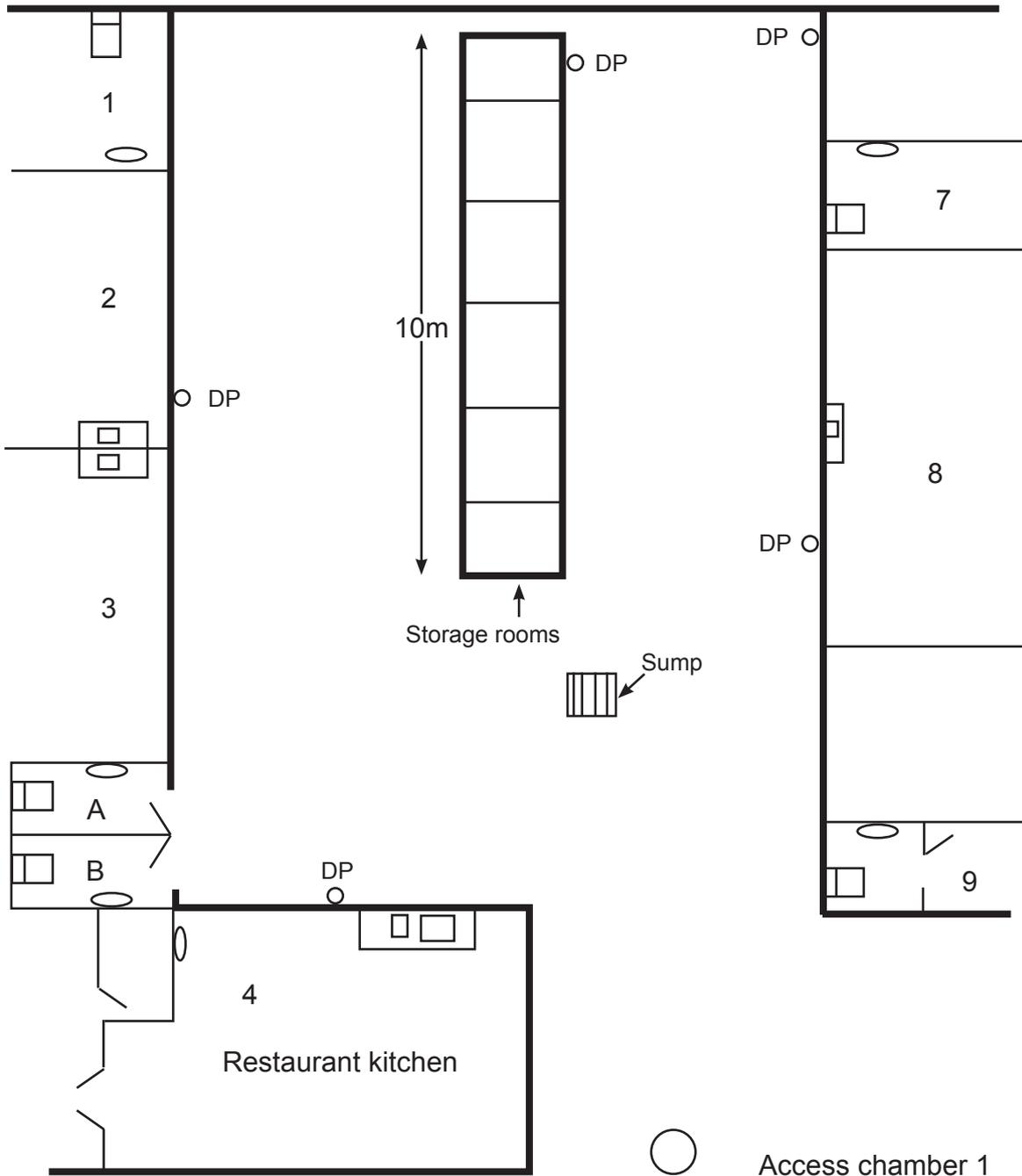
- (b) Surface water from the courtyard is to run towards the sump.

All stormwater drainage lines from the downpipes are to run to the sump.

The stormwater drain from the sump is to terminate at access chamber 2.

Using your knowledge of AS/NZS 3500 Part 3: Stormwater drainage, draw and label the stormwater system. The stormwater drainage system is to include pipework, bends, junctions, fittings, inspections, ventilation, traps and any other relevant components in compliance with the standard.

**QUESTION 10 (cont'd)**



**KEY**

-  Double sink
-  Sink
-  Basin
-  WC
-  DP (downpipes)

 Access chamber 2

**Total 10 marks**



**QUESTION 11**

- (a) On a set of site plans, the longitudinal sectional view of the drainage profile should clearly show relevant points to assist the drainlayer in setting out the drainage system.

List FOUR of these points.

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

(4 marks)

- (b) When installing a septic tank system, it is often necessary to use a distribution box for the effluent lines.

State TWO purposes of a distribution box.

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

(2 marks)

- (c) (i) State the purpose of a sullage tank.

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

- (ii) State the common drainage system that a sullage tank discharges to.

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

(2 marks)

**QUESTION 11 (cont'd)**

(d) Different tests of drains are carried out for a variety of reasons.

State the reason for and briefly describe how each of the following tests would be carried out.

(i) A hydrostatic test.

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(ii) A dye test.

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(2 marks)

(e) New Zealand Building Code Clause G13/AS2 Foul Water covers the construction and installation of gully traps.

This clause includes the following requirements:

- Overflow level to be no less than 25mm above paved and 100mm above unpaved surfaces.
- Adequate support from bedding and backfilling must be included.

Using your knowledge of G13/AS2, list FOUR other separate requirements.

1 

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2 

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3 

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4 

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(2 marks)

**Total 12 marks**

## QUESTION 12

The diagram opposite shows the plan of a house on a building site.

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

The stormwater system is to discharge to the street channel.

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

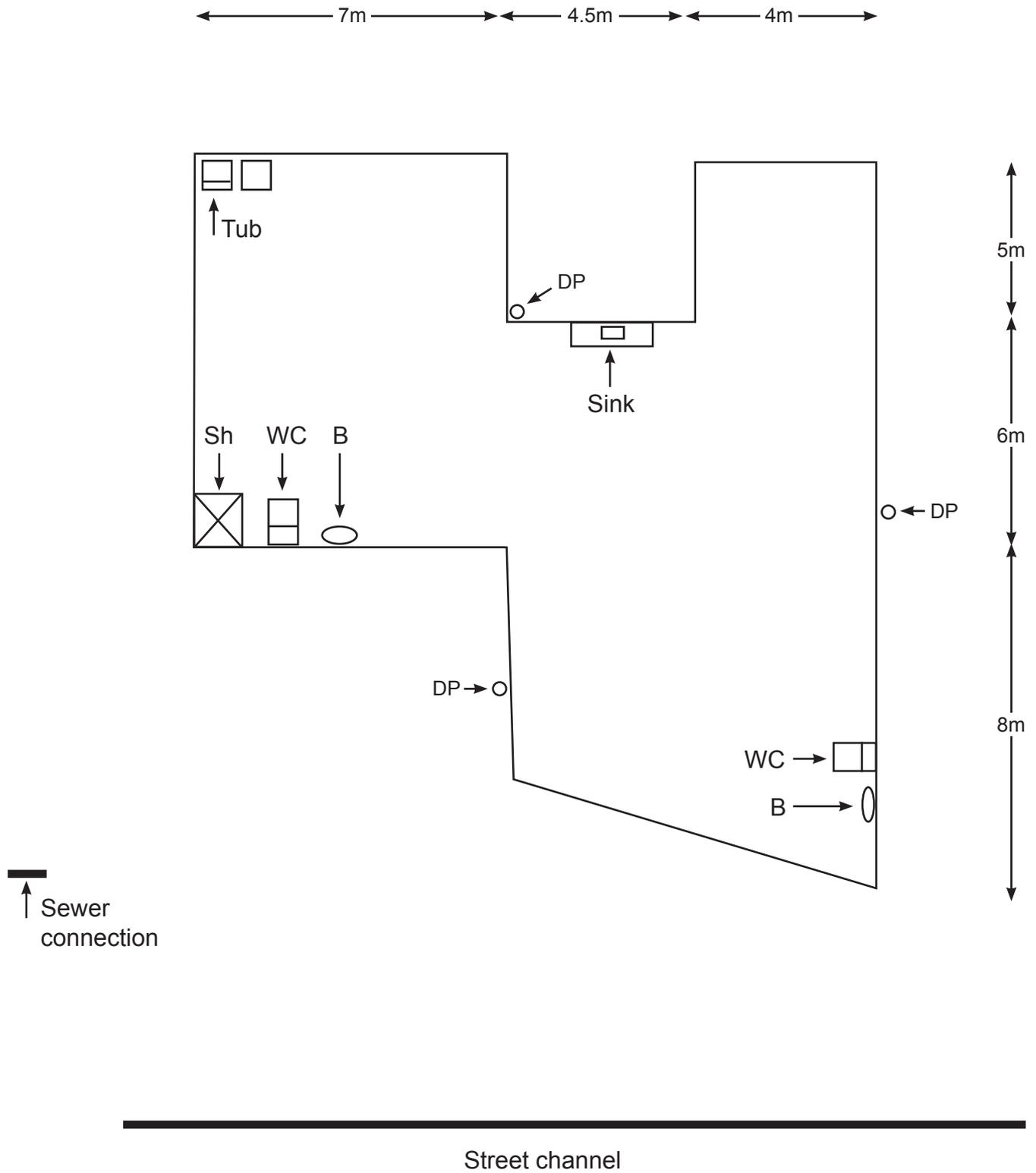
The stormwater drainage system is to comply with AS/NZS 3500 Part 3: Stormwater drainage.

The foul water drainage is to be installed exterior to the building.

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

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

**QUESTION 12 (cont'd)**



**Total 7 marks**

**QUESTION 13**

(a) Explain the following terms as they relate to drainage.

(i) Main drain

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(2 marks)

(ii) Sullage

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(1 mark)

(iii) Infiltration

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(1 mark)

(iv) Surcharge

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(1 mark)

**QUESTION 13** (cont'd)

- (b) List the steps in the procedure for jointing a short length of PVC pipe to a socket by solvent welding.

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(3 marks)

**Total 8 marks**

**QUESTION 14**

- (a) The New Zealand Building Code Clause G13 Foul Water sets out mandatory provisions covering the performance requirements for foul water drainage systems.

List FOUR of these performance requirements.

1 \_\_\_\_\_  
\_\_\_\_\_

2 \_\_\_\_\_  
\_\_\_\_\_

3 \_\_\_\_\_  
\_\_\_\_\_

4 \_\_\_\_\_  
\_\_\_\_\_

(2 marks)

- (b) State the limitations on foul water drains to which the New Zealand Building Code Clause G13/AS2 applies.

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

(1 mark)

- (c) Fully describe the foul water drainage discharges that are outside the scope of the New Zealand Building Code G13/AS2.

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

(2 marks)

**QUESTION 14 (cont'd)**

(d) Holding a limited certificate licence is part of the process of becoming a registered drainlayer.

(i) State the regulatory body to whom the limited certificate licence application is submitted.

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(ii) State who is required to fill in and sign a limited certificate licence application.

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(iii) State who is required to endorse the limited certificate licence application and what undertaking he or she must give.

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(iv) State the maximum length of time for which a limited certificate licence is current.

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(v) State what the holder of a limited certificate licence must do to remain legally entitled to carry out drainage work.

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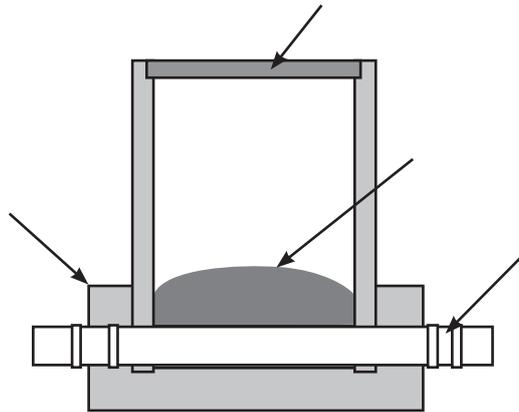
(5 marks)

**Total 10 marks**

### QUESTION 15

The drawing below shows a circular access chamber with an open drain.

On the drawing, name all the arrowed components in accordance with the New Zealand Building Code Clause G13/AS2 Foul Water.



Total 2 marks











For Examiner's use only

Question number	Marks	Marks
1		
2		
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