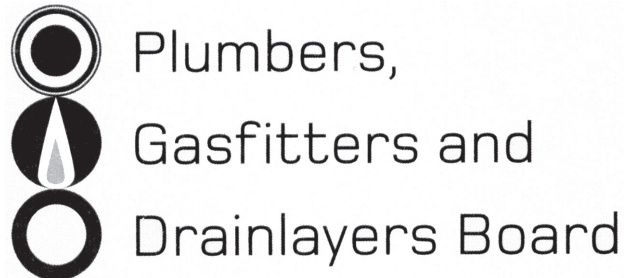


Affix label with Candidate Code
Number here.
If no label, enter candidate
Number if known

.....

No. 9196



REGISTRATION EXAMINATION, NOVEMBER 2010

CERTIFYING GASFITTER

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 November 2010 were provided with the following documents:

- NZS 5261 Gas installation
- Resource Booklet (Appended to this booklet)

SECTION A

QUESTION 1

A customer has requested that gas appliances be installed in his new house. A plan and elevations of the gas installation for the house are given in the resource booklet.

The customer has requested that the installation pipework be made of a flexible composite pipe material that he has selected.

To pipe size the installation you will require the Composite Pipe Sizing Guide and the Composite Pipe Sizing Chart. Both of these documents can be found in the resource booklet.

Use the following information and the resource booklet to complete the tables below:

Site Specification	
Gas Type	LPG
Supply Pressure	3 kPa
Appliances	
Water Heater	220 MJ/hr
Hob Burners	35 MJ/hr
Space Heater	28 MJ/hr
Gas Fire	38 MJ/hr

Sizing Table	
Allowable Pressure Drop	
Main Run	
Total MJ	
Additional Metres Per Fitting	
Number of Fittings	
Corrected Length	
Main Run Pipe Diameter	

Pipe Section Table		
Pipe Section	MJ	Pipe Size
A – B		
B – C		
B – D		
D – E		
D – F		
F – G		
F – H		

Total 25 marks

QUESTION 2

A gas-fired, electronic, fan-forced, convection space heater is to be installed on an internal wall as shown in the plan given in the resource booklet.

The flue for the heater is a 75 mm vertical coaxial type as the heater is room sealed and 95% efficient.

The builder has requested a sketch showing how the installation of the heater will impact on the construction of the house, and specific building code compliance factors.

In the space below, draw and label a sketch showing where any pipes and/or flues will run and pass through any part of the building.

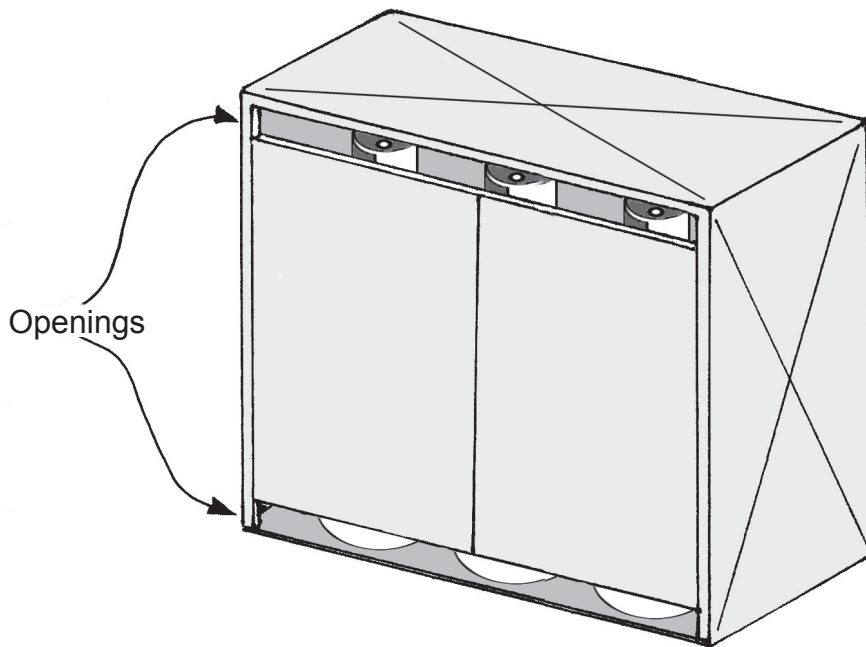
Total 7 marks

QUESTION 3

Three 45 kg LPG cylinders are housed in a sheet metal enclosure.

Openings for ventilation are required in the top and bottom of the access door.

The openings must be 900 mm wide.



Calculate the minimum height of each opening in accordance with NZS 5261. Show all working.

Total 4 marks

QUESTION 4

A customer has requested that the LPG cylinders which are supplying his house be situated in an enclosure 30 metres away from the house.

- (a) State the effect this will have on the pressure within the installation.

(1 mark)

- (b) Describe TWO steps that could be taken to maintain the pressure at an acceptable level.

(2 marks)

Total 3 marks

QUESTION 5

- (a) A restaurant in Queenstown is supplied with LPG in four 45 kg cylinders. When the cylinders are exchanged it is found that the cylinders contain significant quantities of unused gas despite the indicator on the changeover regulator showing low gas pressure.

State what prevents the use of this gas.

(2 mark)

- (b) Give TWO ways in which the problem in (a) can be rectified.

1

2

(2 marks)

- (c) Several factors govern the vaporisation rate of LPG in a container.

Give TWO of these.

1

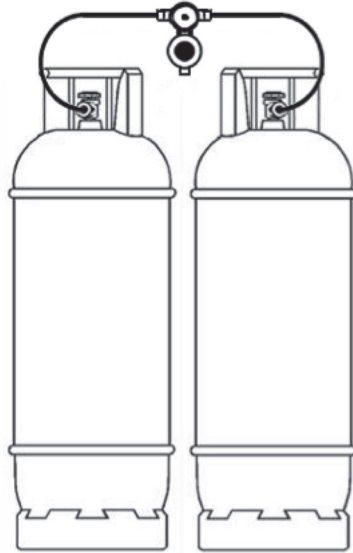
2

(2 marks)

Total 6 marks

QUESTION 6

State TEN factors that should be considered when siting and installing a pair of 45 kg LPG exchange cylinders in a domestic installation.



- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____
- 6 _____
- 7 _____
- 8 _____
- 9 _____
- 10 _____

Total 5 marks

QUESTION 7

Give the conditions under which a Location Test Certificate is required.

Total 3 marks

QUESTION 8

A plant room is fitted with mechanical supply ventilation and natural exhaust ventilation. The plant room houses a 650 MJ induced draft boiler and two 40 MJ storage hot water cylinders with atmospheric burners.

The following extract comes from NZ Building Code Clause G4.

2.2.2 A mechanical ventilation system shall:

- a) For each kW of gas consumption (of all appliances in the plant room) provide *outdoor air* at the rate of:
 - (i) 3.6 m³/h for *forced or induced draught appliances*, and
 - (ii) 7.2 m³/h for appliances with *atmospheric burners*, and
- b) Remove exhaust air from the room either:
 - (i) mechanically at one third the inlet rate, or
 - (ii) naturally via high-level openings having a free ventilation area of no less than 600 mm² per kW of total gas consumption for all appliances in the room.

- (a) Determine the minimum volume of air per hour the ventilation system must be able to supply.

(5 marks)

- (b) Calculate the minimum size of the high level opening required.

(2 marks)

- (c) A mechanical exhaust is to be fitted to the plant room.

Find the minimum m³/hr the exhaust must be capable of moving.

(1 mark)

QUESTION 8 (cont'd)

(d) State the additional safety requirement that must be met with a mechanical ventilation system.

(2 marks)

Total 10 marks

QUESTION 9

The diagrams (Figure 1 and Figure 2) below show gas pressure regulators with internal relief.

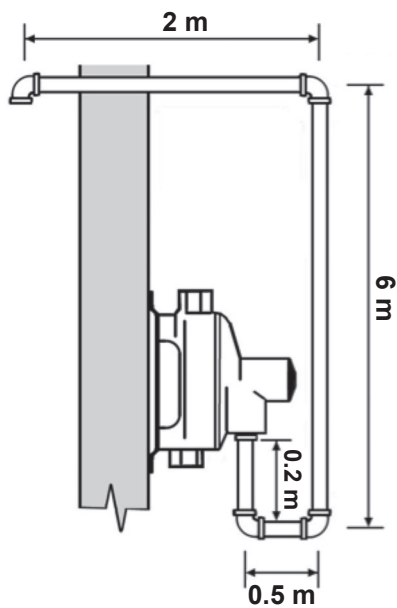


Figure 1

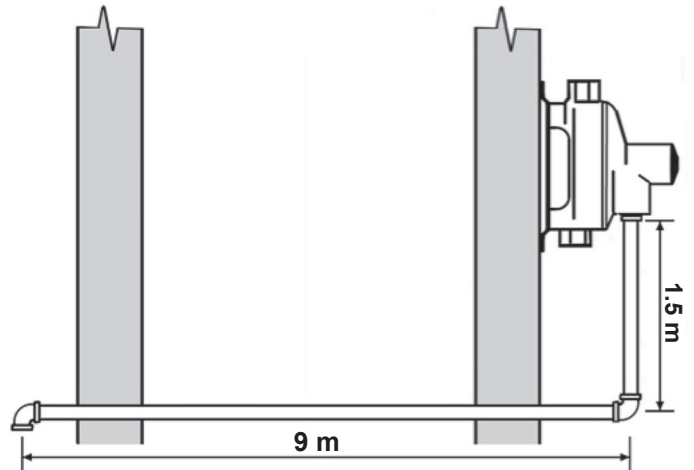


Figure 2

Vent lines for the relief of the gas pressure regulators are to be installed.

State the minimum vent line size requirements that must be met in each case.

Figure 1

Figure 2

Total 2 marks

QUESTION 10

A package burner is to be selected for a commercial boiler.

State THREE factors that should be taken into account in order to select an appropriate package burner.

- 1 _____
- 2 _____
- 3 _____

Total 3 marks

QUESTION 11

A facility manager has requested a report be completed showing the actual consumption of a boiler. The appliance data plate shows an input of 550 MJ.

The natural gas boiler is run on high and it takes 2 minutes 35 seconds to turn the test dial on the meter 0.5 m³.

The supply pressure is 7.5 kPa.

Natural gas has a heating value of 42 MJ/m³.

Calculate in MJ the difference between the actual consumption of the boiler and the information shown on the data plate. Show your working.

Total 7 marks

QUESTION 12

A gas-fired storage water heater of 180 litres capacity has a gas burner rated at 45 MJ/h.

The thermal efficiency of the appliance is 78%.

The specific heat capacity of water is 4.2 kJ/kg °C.

Calculate how long in minutes it will take to heat the water from 18°C to 70°C.

Formula:

Heat energy = mass × specific heat × temperature rise

Total 5 marks

QUESTION 13

A gas-fired warm air central heating system is to be designed for a house.

(a) State where heating outlets should be installed in bedrooms.

(2 marks)

(b) Give FOUR factors that should be considered when deciding where to position a room thermostat.

1

2

3

4

(2 marks)

(c) Give TWO problems that can arise if the fan speed on the furnace is set too low.

1

2

(2 marks)

(d) Give TWO problems that can arise if the fan speed on the furnace is set too high.

1

2

(2 marks)

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.

Note that should your choice of answer be unclear in this section of the examination no marks will be awarded for that question.

1. Exposure to carbon monoxide should be controlled so the average level over an eight-hour day does not exceed which of the following?

- A Up to 10 parts per million
- B Up to 25 parts per million.
- C Up to 45 parts per million.
- D Up to 50 parts per million.
- E Up to 60 parts per million.

2. A natural gas boiler has been installed and commissioned.
What is the optimal carbon dioxide content in the flue gases?

- A 8%
- B 12%
- C 18%
- D 22%
- E 25%

3. What is the definition of maintenance rate in relation to gasfitting?
- A The volume of gas an oven bypass allows through to the main burner to maintain the desired temperature.
 - B The charge-out rate a plumber or gasfitter invoices for maintenance work.
 - C The monthly charge from a gas supply company to cover service line maintenance.
 - D A fee included when quoting for a new installation job to cover any maintenance required in the first 12 months of use.
 - E A levy charged by the Plumbers, Gasfitters and Drainlayers Board to maintain an up-to-date register of tradespeople.

4. In relation to alternating current, what is the definition of extra low voltage?

- A Not exceeding 50 Volts.
- B Below 38 Volts.
- C 24 Volts and below.
- D Not exceeding 12 Volts.
- E Less than 25 Volts.

☐

5. What is the minimum clearance horizontally from a fan-assisted flue terminal of an appliance rated at 210 MJ/hr to an openable window?

- A 300 mm.
- B 500 mm.
- C 1000 mm.
- D 1200 mm.
- E 1500 mm.

☐

6. What must the minimum clearance to grease filters from a hotplate burner be according to NZS 5261?

- A 300 mm.
- B 500 mm.
- C 1000 mm.
- D 1050 mm.
- E 1200 mm.

☐

7. What must the distance between the floor and the bottom natural ventilation opening of an enclosure containing gas pressure raising devices not exceed according to NZS 5261?

- A 100 mm above the floor.
- B 10 mm per Joule of the maximum relief volume.
- C 10% of the height of the enclosure.
- D 140 mm above the floor.
- E 5% of the height of the enclosure.

☐

8. What is the minimum vertical minimum clearance between a gas pendant light and combustible materials according to NZS 5261?

- A 100 mm.
- B 300 mm.
- C 400 mm.
- D 450 mm.
- E 500 mm.

☐

9. What is the minimum thickness of a material that is deemed to be fire resistant according to NZS 5261?

- A 6 mm.
- B 8 mm.
- C 10 mm.
- D 15 mm.
- E 20 mm.

☐

10. According to NZS 5261 a damp cloth draped from a pipe to wet ground is a method to ensure safe discharge of static electricity present in what sort of pipe material?

- A It is not acceptable. A bonding strap should be used.
- B Steel.
- C Plastics.
- D Copper.
- E Aluminium.

☐

11. Why are heat exchangers used in high efficiency gas appliances often constructed from stainless steel?
- A The stainless steel is a good heat conductor.
 - B Stainless steel is less likely to fracture from expansion due to temperature fluctuations.
 - C The appliance can produce higher temperatures without damaging the heat exchanger.
 - D The heat exchanger can be thin, making the appliance lighter.
 - E Because of the corrosive nature of condensate.

☐

12. When guidance is required for flue design, which of the following standards should be used?
- A AS/NZS 2430.
 - B NZS 5262.
 - C AS/NZS 1530.
 - D AS 5601.
 - E AS 2885.

☐

Total 12 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		

Composite Pipe System Sizing Guide

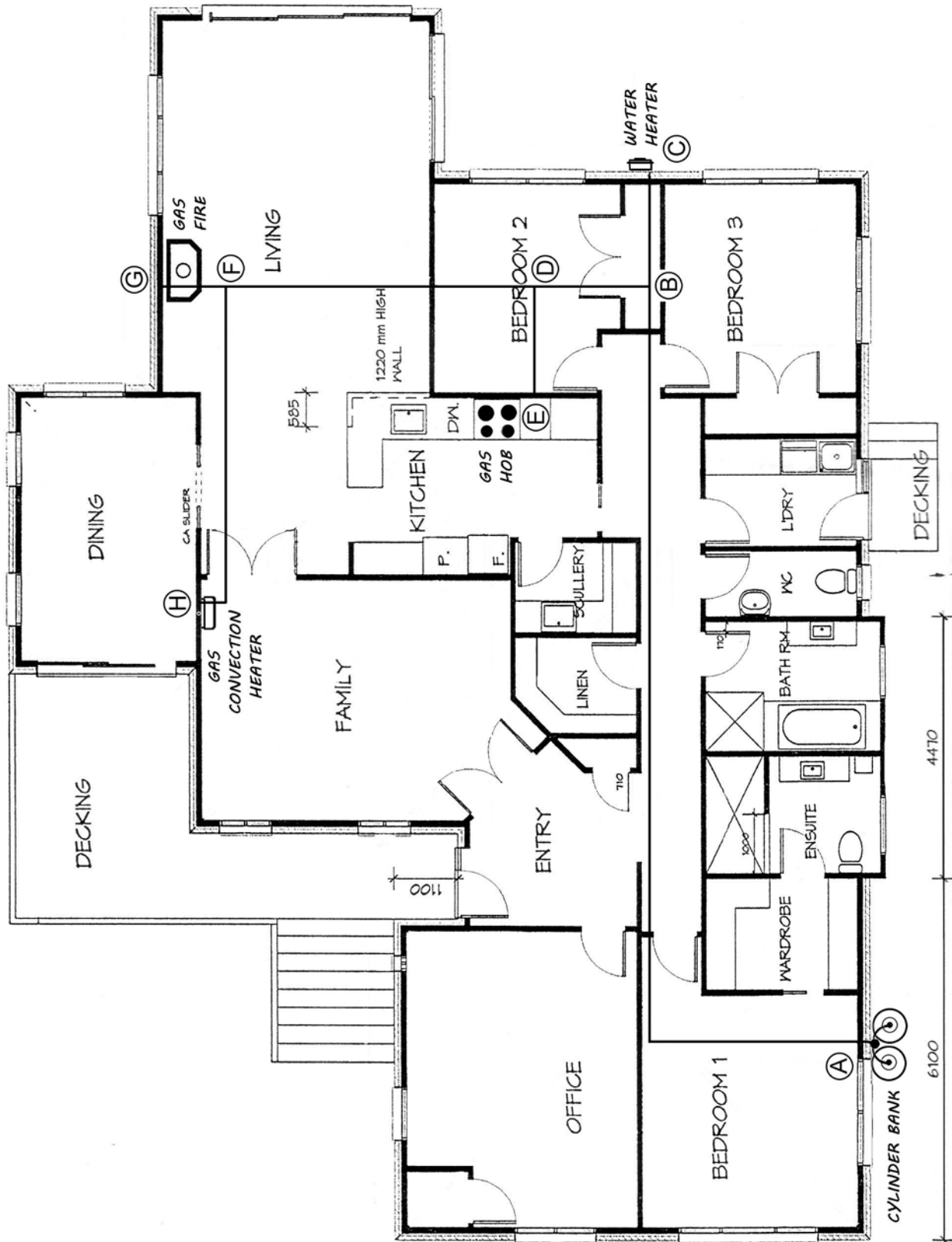
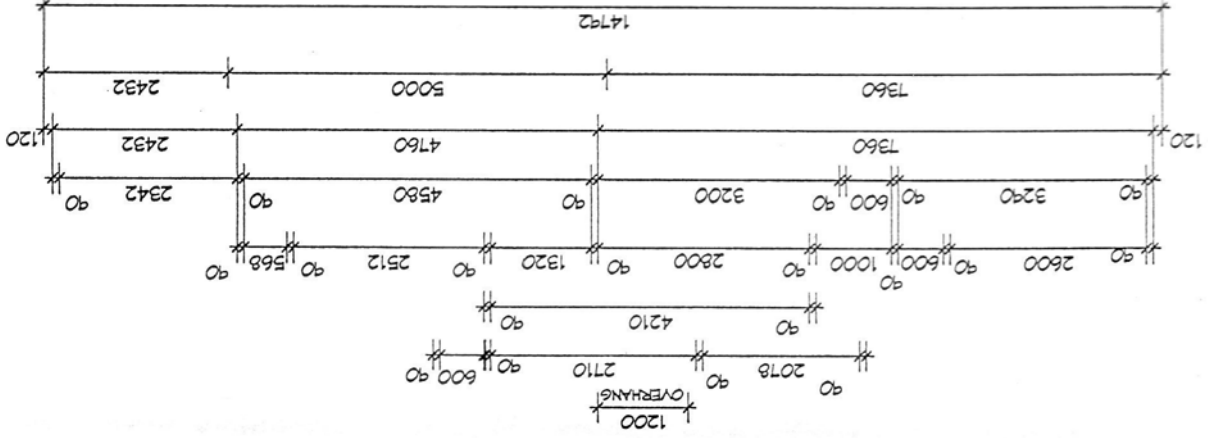
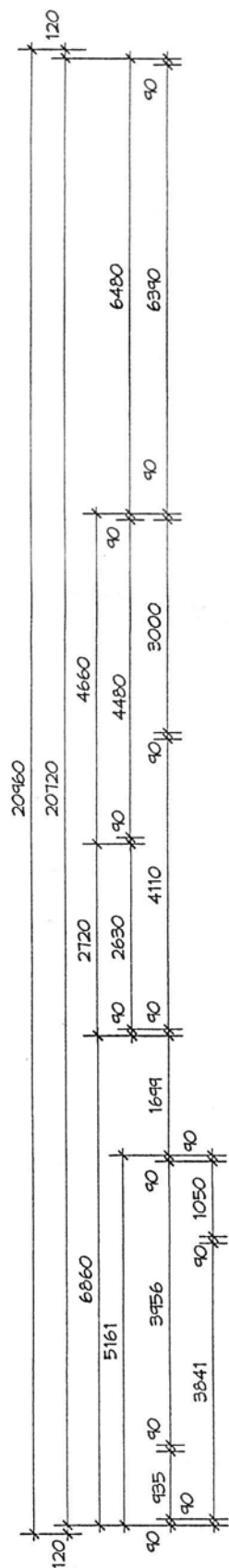
Complete the Sizing Table and the Pipe Section Table on page 1 of your examination paper following the steps below.

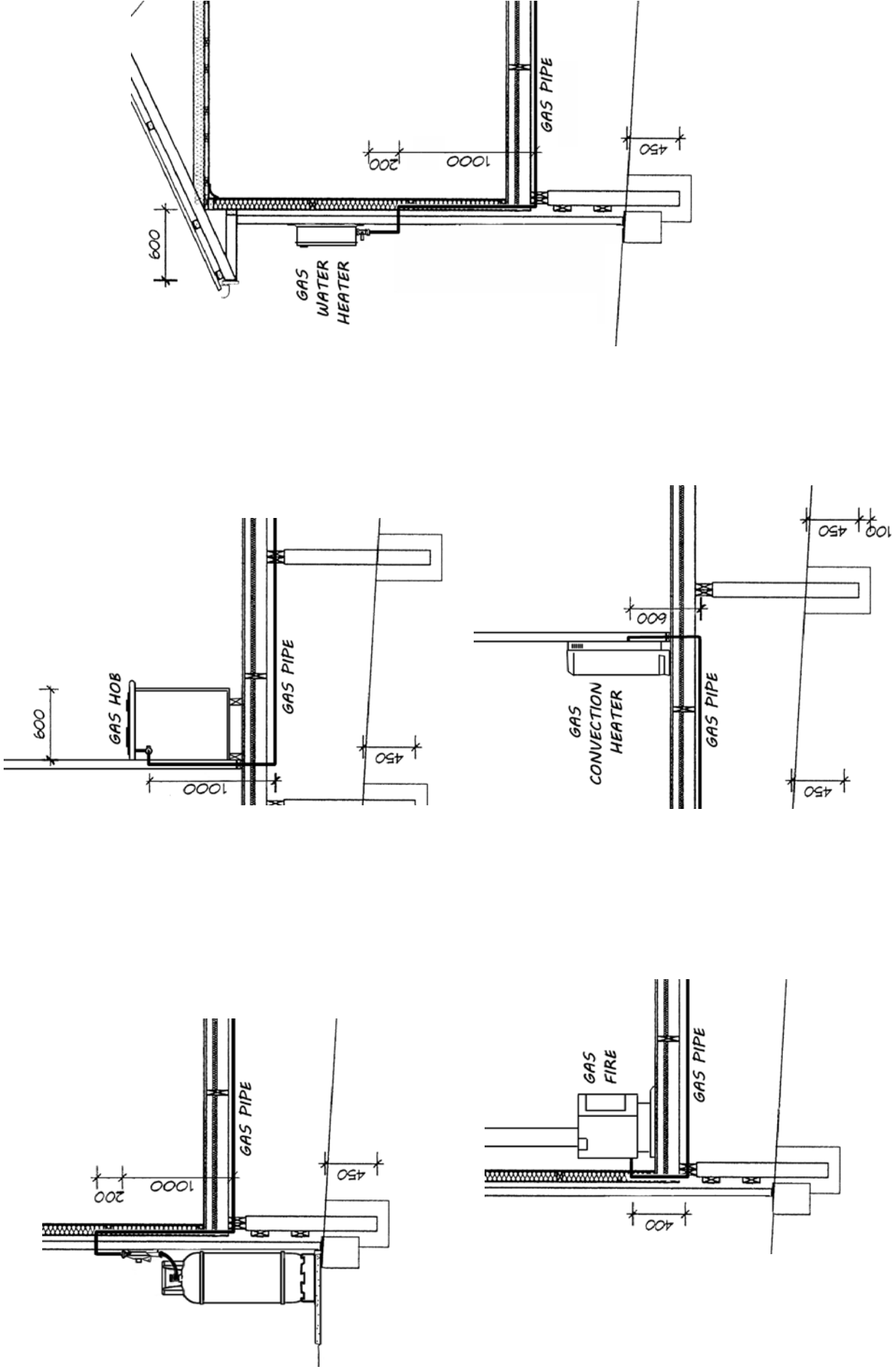
1. Use the **Allowable Pressure Drop** indicated in 2.4.2.4 of NZS 5261. Write this in the sizing table.
2. Identify which branch has the largest megajoule load using the plans found in this resource booklet and the information found on page 1 of your question and answer booklet.
3. Tabulate the length of the pipework, in metres, from the end of the chosen branch to the source of the gas supply. This is the **Main Run**, write this length in the sizing table.
4. Add all appliance megajoule ratings to calculate the total load of the installation. This is the **Total MJ**, write this total in the sizing table.
5. Use the instructions below and the **Composite Pipe Correction Factor Chart** on the back page of this booklet to find the correct pipe sizes required for this installation.

Note: Make sure you use the correct chart section for the installation

- Find the total **Pipe Length** (equal to or greater than) of the **Main Run** in the top row of the appropriate chart.
 - Drop down that column until you find the number equal to or greater than **Total MJ** for the installation.
 - Move to the right hand side of the chart to find the **Additional Metres per Fitting**. Write this **Additional Metres per Fitting** length in the sizing table.
 - Count the number of fittings on the **Main Run** of the installation identified in step 3. Include bends, junctions, and termination points (bracket elbows, hose plates, meter or cylinder connection, etc.). Write this **Number of Fittings** in the sizing table.
6. Multiply the **Number of Fittings** by the **Additional Metres per Fitting** figure.
 - Add this value to the **Main Run** from step 3. This is the new **Corrected Length** of pipework. Write this **Corrected Length** in the sizing table.
 7. Use this **Corrected Length** on the **Composite Pipe Correction Factor Chart** in the top row of the appropriate chart.

The column below this **Corrected Length** is now the only column required for sizing of all of the pipe sections of the installation.
 8. Calculate the megajoules that each pipe section conveys and record these in the MJ column of the **Pipe Section Table**.
 9. Using the column from step 7, find the correct megajoule loading (equal or greater than) for each branch and follow the row to the left of the chart to find the corresponding pipe size (diameter).
 10. Record the pipe sizes in the **Pipe Section Table** to complete the exercise.





ELEVATIONS OF GAS TERMINATIONS

NOTE: Images not to scale use measurements shown

Composite Pipe Correction Factor Chart

Natural Gas flow through composite pipe (MJ/hr) Supply pressure 2.5 kPa (Pressure drop 10%)													Additional Metres Per Fitting
Pipe Diameter	Pipe Length												
	10	12	14	16	18	20	22	24	26	28	30		
15mm Ø	95	90	85	80	75	70	65	60	55	50	45	2.5	
20mm Ø	210	200	190	175	160	150	140	130	125	115	110	1.6	
25mm Ø	380	360	335	320	305	290	275	260	245	220	210	0.8	
32mm Ø	770	720	670	640	610	580	550	520	490	420	360	0.6	
40mm Ø	1450	1360	1280	1215	1150	1100	1060	1020	980	830	790	N/A	
50mm Ø	2760	2580	2430	2310	2120	1230	1150	1070	1010	950	890	N/A	
Natural Gas flow through composite pipe (MJ/hr) Supply pressure 2.75 kPa (Pressure drop 10%)													Additional Metres Per Fitting
Pipe Diameter	Pipe Length												
	10	12	14	16	18	20	22	24	26	28	30		
15mm Ø	100	95	90	85	80	75	70	65	60	55	50	1.4	
20mm Ø	220	210	200	190	175	160	150	140	130	125	115	0.8	
25mm Ø	410	380	360	335	320	305	290	275	260	245	220	0.6	
32mm Ø	825	770	720	670	640	610	580	550	520	490	420	N/A	
40mm Ø	1560	1450	1360	1280	1215	1150	1100	1060	1020	980	830	N/A	
50mm Ø	2970	2760	2580	2430	2310	2120	1230	1150	1070	1010	950	N/A	
LPG flow through composite pipe (MJ/hr) Supply pressure 3.0 kPa (Pressure drop 10%)													Additional Metres Per Fitting
Pipe Diameter	Pipe Length												
	10	12	14	16	18	20	22	24	26	28	30		
15mm Ø	115	100	95	90	85	80	75	70	65	60	55	1.7	
20mm Ø	250	220	210	200	190	175	160	140	140	130	125	1.4	
25mm Ø	450	410	380	360	335	320	305	290	275	260	245	0.8	
32mm Ø	900	825	770	720	670	640	610	570	550	520	490	0.6	
40mm Ø	1700	1560	1450	1360	1280	1215	1170	1090	1060	1020	980	N/A	
50mm Ø	3230	2970	2760	2580	2430	2310	2190	2080	1150	1070	1010	N/A	
LPG flow through composite pipe (MJ/hr) Supply pressure 2.75 kPa (Pressure drop 15%)													Additional Metres Per Fitting
Pipe Diameter	Pipe Length												
	10	12	14	16	18	20	22	24	26	28	30		
15mm Ø	160	140	125	115	100	95	90	85	80	75	70	1.4	
20mm Ø	360	310	270	250	220	210	200	190	175	160	140	0.8	
25mm Ø	660	560	500	450	410	380	360	335	320	305	290	0.6	
32mm Ø	1320	1130	1000	900	825	770	720	670	640	610	570	N/A	
40mm Ø	2500	2130	1880	1700	1560	1450	1360	1280	1215	1170	1090	N/A	
50mm Ø	4750	4050	3580	3230	2970	2760	2580	2430	2310	2190	2080	N/A	
LPG flow through composite pipe (MJ/hr) Supply pressure 5.0 kPa (Pressure drop 10%)													Additional Metres Per Fitting
Pipe Diameter	Pipe Length												
	10	12	14	16	18	20	22	24	26	28	30		
15mm Ø	210	160	140	125	115	100	95	90	85	80	75	2	
20mm Ø	450	360	310	270	250	220	210	200	190	175	160	1.7	
25mm Ø	820	660	560	500	450	410	380	360	335	320	305	1.3	
32mm Ø	1650	1320	1130	1000	900	825	770	720	670	640	610	0.8	
40mm Ø	3130	2500	2130	1880	1700	1560	1450	1360	1280	1215	1170	0.5	
50mm Ø	5900	4750	4050	3580	3230	2970	2760	2580	2430	2310	2190	N/A	