

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

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No. 9196



Plumbers,  
Gasfitters and  
Drainlayers Board

## REGISTRATION EXAMINATION, NOVEMBER 2016

# 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 18–21 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 2016 were provided with the following documents:

- New Zealand Building Code Clause E2 - External Moisture
- AS/NZS 5601 Part 1: General installations
- AS/NZS 5601 Part 2: LP Gas installations in caravans and boats for non-propulsive purposes

## 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 =  $0.7854 \times D^2$

Volume of cylinder =  $\pi \times R^2 \times H$  or Volume of cylinder =  $0.7854 \times D^2 \times H$

Heating time =  $\frac{\text{mass of water (kg)} \times 4.2 \times \text{temp diff (}^\circ\text{C)} \times 100}{\text{heat energy input per hour in kJ} \times \text{efficiency (\%)}}$

Correction factor =  $\frac{\text{atmospheric pressure} + \text{supply pressure}}{\text{atmospheric pressure}}$

Gas rate (m<sup>3</sup>/h) =  $\frac{\text{volume (m}^3\text{)} \times 3600}{\text{time (seconds)}}$

## SECTION A

### QUESTION 1

List THREE Acts of Parliament that have **specific references** to gasfitting.

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

Total 3 marks

## QUESTION 2

A corrugated iron roof has a pitch of  $20^\circ$ . The maximum wind speed expected for the location is 35 metres per second.

A 300 mm gas appliance flue has been installed penetrating 600 mm below the ridge.

Sketch a diagram showing the support and flashing required for the installation. Show all measurements.

The completed installation is to comply with the minimum requirements of the New Zealand Building Code clause E2/AS1 External Moisture.

Total 8 marks

### QUESTION 3

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, the Composite Pipe Sizing Guide and the Composite Pipe Sizing Chart will be required. 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	
Main run	
Total MJ	
Additional metres per fitting	
Number of fittings	
Corrected length	
Main run pipe diameter	

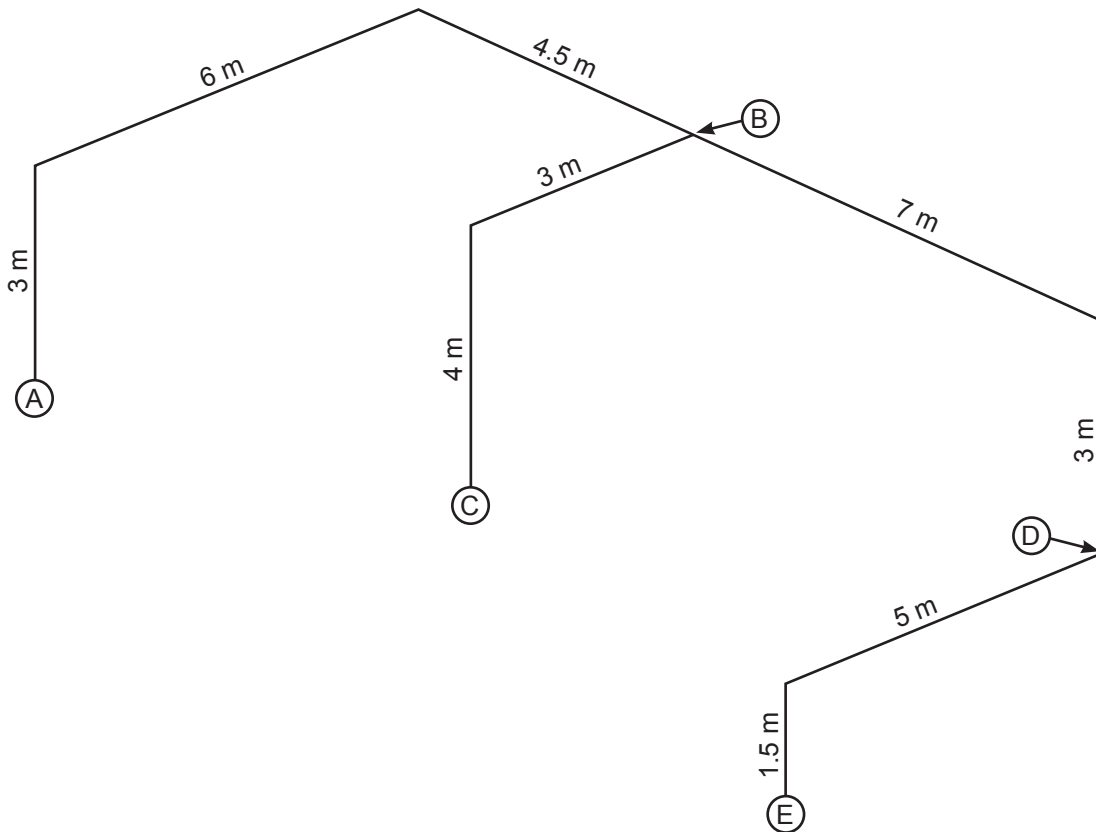
Pipe Section Table		
Pipe Section	MJ	Pipe Size
A – B		
B – C		
B – D		
D – E		
D – F		
F – G		
F – H		

**Total 24 marks**

### QUESTION 4

The diagram below shows a schematic of copper pipework to be installed in a commercial building. Pipe clips are to be used to support the pipework.

- Support is to be provided 100 mm from the end of each pipe.
- Three clips are to be included for each tee, each located 100 mm from the tee.
- Two clips are to be included for each bend, each located 100 mm from the bend.



Complete the following table to show the number of clips required for the pipework. The clips are to be installed to comply with the minimum requirements of AS/NZS 5601 Part 1.

Pipe Section	Number of clips
A – B 50 mm diameter pipe	
B – C 25 mm diameter pipe	
B – D 40 mm diameter pipe	
D – E 32 mm diameter pipe	

Total 4 marks

## QUESTION 5

A plant room is fitted with mechanical supply ventilation and natural exhaust ventilation directly to outside. The plant room houses a 450 MJ induced draft boiler and two 30 MJ storage hot water cylinders with atmospheric burners.

- (a) Determine in  $\text{m}^3$  the minimum volume of air per hour the ventilation system must be able to supply.

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(5 marks)

- (b) Suppose a natural high level exhaust opening is used.  
Calculate the minimum size of the exhaust opening.

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(2 marks)

- (c) Suppose a mechanical high level exhaust is used.

Calculate in  $\text{m}^3$  the minimum volume of air the fan must be capable of moving per hour.

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(1 mark)

- (d) State the additional safety requirement that must be met, according to AS/NZS 5601, with regard to the operation of gas appliances with a mechanical ventilation system.

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(2 marks)

**Total 10 marks**



## QUESTION 6

List FOUR aspects related to a gas installation that must be taken into account before suitability of a proprietary piping system can be confirmed as specified by AS/NZS 5601 Part 1.

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

Total 2 marks

**QUESTION 7**

- (a) A natural gas appliance has an efficiency of 80%.

The test dial on the gas meter connected to this appliance completes 1 revolution in 1 minute 10 seconds.

The test dial on the meter is marked 0.05 m<sup>3</sup> per revolution.

The heating value (HV) of natural gas is 40 MJ/m<sup>3</sup>.

Calculate, in kW, the energy output for the appliance.

Formula:

$$\text{Gas rate in MJ/hr} = \frac{\text{m}^3 \times \text{HV} \times 3600}{\text{time taken in seconds}}$$

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(5 marks)

- (b) If the same meter used in (a) was measuring LPG, state how the amount of energy passed during 1 revolution of the test dial would change.

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(1 mark)

**Total 6 marks**

## QUESTION 8

State FIVE factors that need to be specified when selecting a regulator for a gas installation.

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

**Total 5 marks**

**QUESTION 9**

(a) List SIX items of information that must be permanently marked on every gas appliance.

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

(3 marks)

(b) A natural draft flue is being designed for a gas appliance.

State SIX factors to be taken into account when calculating the size of the flue.

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

(3 marks)

**Total 6 marks**

**QUESTION 10**

The Gas (Safety and Measurement) Regulations define three categories of gasfitting work: low-risk gasfitting, general gasfitting and high-risk gasfitting.

(a) Give TWO examples of gasfitting that are classed as low-risk gasfitting.

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

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

(2 marks)

(b) Give TWO examples of gasfitting that are classed as high-risk gasfitting.

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

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

(2 marks)

(c) State what would be classed as general gasfitting.

\_\_\_\_\_

(1 mark)

(d) Describe what is meant by the term 'like for like' in relation to the installation of gas appliances.

\_\_\_\_\_

(1 mark)

**Total 6 marks**

## QUESTION 11

Where the potential of a fall exists on a work site, hazards need to be managed.

(a) State how the hazard of working at height can be eliminated.

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(1 mark)

(b) Give FOUR examples of how the hazard of working at height can be minimised.

1 

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2 

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3 

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4 

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(4 marks)

**Total 5 marks**

**QUESTION 12**

(a) State the organisation to which a Particular Hazardous Work Notification form needs to be submitted.

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(1 mark)

(b) State how long before work commences a Particular Hazardous Work Notification form should be submitted.

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(1 mark)

(c) Give FIVE items of information that are to be provided on a Particular Hazardous Work Notification form.

1 

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2 

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3 

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4 

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5 

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(5 marks)

**Total 7 marks**

### QUESTION 13

Use AS/NZS 5601 Part 1 to complete the table below to show the outlet operating pressure a consumer piping gas regulator is permitted to provide before a permanent and durable notice displaying the pressure is required.

Maximum outlet operating pressure LPG	
Maximum outlet operating pressure natural gas	

**Total 2 marks**



**QUESTION 14**

A fault has developed on a gas oven. After the oven has been running for 20 minutes, it shuts the gas off and must be manually restarted.

Give THREE likely causes for this to occur.

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

**Total 3 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. According to AS/NZS 5601, when using uPVC for a flue, what temperature should the flue gases not be permitted to exceed?

- A 60°C.
- B 65°C.
- C 75°C.
- D 90°C.
- E 100°C.

2. LPG cylinders need to be restrained against seismic activity if they are larger than what capacity?

- A 8 litres.
- B 12 litres.
- C 18 litres.
- D 20 litres.
- E 25 litres.

3. How is the capacity of a sub-meter determined?

- A One whole revolution of the test dial is the capacity of the meter.
- B The test dial is used to check the volume of the meter.
- C The capacity of the meter multiplied by the meter factor.
- D The gas supplier must be contacted to ascertain meter volumes.
- E The volume is indicated on the meter badge.

4. Which of the following is not a flame failure system?

- A Flame rectification.
- B Mercury vapour valve.
- C Oxygen depletion pilot.
- D Ultra violet.
- E Thermoelectric.

5. When a practising licence holder changes address, within what period must the Registrar be notified?

- A 10 days.
- B 15 days.
- C 1 month.
- D 3 months.
- E 6 months.

6. According to AS/NZS 5601 Part 2, what is the minimum possible permitted free area of the total permanent ventilation for any space in a caravan that contains a gas appliance?

- A 1000 mm<sup>2</sup>.
- B 2000 mm<sup>2</sup>.
- C 3000 mm<sup>2</sup>.
- D 4000 mm<sup>2</sup>.
- E 5000 mm<sup>2</sup>.

7. A 9 kg LPG cylinder is permitted to be used indoors with which type of connection?

- A Companion/camping.
- B QCC.
- C POL.
- D CGA555.
- E Primus.

8. When a gas appliance is to be installed in garage how high above the ground should the burners and combustion air intake be situated?

A 100 mm.

B 250 mm.

C 300 mm.

D 450 mm.

E 600 mm.

9. Other than a portable space heater, when is it permissible for a gas appliance fitted with wheels and a flexible hose to not be fitted with a device that will restrict the movement of the appliance?

A When the mass of the appliance is 20 kg or less.

B When it is installed in a commercial kitchen.

C When the mass of the appliance exceeds 30 kg.

D When the width of the appliance exceeds the height.

E When it is installed below an air extraction unit.

**Total 9 marks**

For Examiner's use only

Question number	Marks	Marks
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
Section B		
Total		

# Composite Pipe System Sizing Guide

1. Using the information provided Identify and label which branch has the largest total Mega joule load.
2. Tabulate the length of the pipework from the end of the chosen branch back to the source of gas supply. This is the **Main Run** write this length in the sizing table.
3. Add all appliance mega-joule ratings together to calculate the total load of the installation. This is the **Total Mj** write this total in the sizing table.
4. Use the '**Composite Pipe Correction Factor Chart**' from your resource to find the correct pipe sizes required for this installation as below.

## ***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 Meters per Fitting**' for your installation. Write this **Additional Meters 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 connections etc). Write this **Number of Fittings** in the sizing table.
5. Multiply the **Number of Fittings** by the '**Additional Meters 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.
  6. Use this **Corrected Length** on the '**Composite Pipe Correction Factor Chart**' again in the top row of the appropriate chart.
    - Use the column in the chart below this '**Corrected Length**' to find the Mj ratings for each pipe section of this installation.

## ***This is now the only column required for sizing of all the pipe sections of your installation.***

7. Complete the **Pipe Section Table**
  - Calculate the Mega Joules that each section of pipework conveys. In the selected column find the correct loading for the branch and follow the row to the left of the chart to find the corresponding pipe diameter.
  - Record all Mj loadings and pipe sizes in the **Pipe Section Table** to complete the exercise.

## Composite Pipe Correction Factor Chart

Natural Gas flow through composite pipe (Mj/hr) Supply pressure 2.5 kPa (Pressure drop 10%)												Additional Meters 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 Meters 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	0.8
20mm Ø	220	210	200	190	175	160	150	140	130	125	115	0.4
25mm Ø	410	380	360	335	320	305	290	275	260	245	220	0.2
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 Meters 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 10%)												Additional Meters 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	2.2
20mm Ø	360	310	270	250	220	210	200	190	175	160	140	1.8
25mm Ø	660	560	500	450	410	380	360	335	320	305	290	1.3
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 2.5 kPa (Pressure drop 10%)												Additional Meters 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	3.8
20mm Ø	450	360	310	270	250	220	210	200	190	175	160	2.9
25mm Ø	820	660	560	500	450	410	380	360	335	320	305	2.2
32mm Ø	1650	1320	1130	1000	900	825	770	720	670	640	610	1.9
40mm Ø	3130	2500	2130	1880	1700	1560	1450	1360	1280	1215	1170	0.9
50mm Ø	5900	4750	4050	3580	3230	2970	2760	2580	2430	2310	2190	N/A

