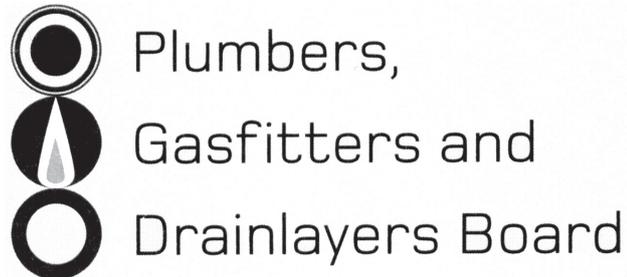


No. 9196



CRAFTSMAN EXAMINATION, NOVEMBER 2008  
**GASFITTING**

ANSWER SCHEDULE



## ANSWER 1

(a) PG&D Act

Gas Act

Building Act

Consumer Guarantees Act

OSH

(Any 3, 1 mark each) (3 marks)

(b) The craftsman gasfitter responsible for the work accepts the legal responsibility for testing and commissioning the installation and that it complies with the appropriate codes and standards as do the appliances in the system.

(2 marks)

(c) 1 The owner of the premises where the work has been carried out.

2 The gas supplier.

3 The Plumbers Gasfitters and Drainlayers Board.

4 The certifying (craftsman) gasfitter.

(4 marks)

**Total 9 marks**

## ANSWER 2

(a) Installed pipe work shall be:

1 Firmly fastened in a protected location outside any structure or false bottom.

2 All joints and valves must be accessible for inspection.

3 Protected against vibration.

4 Protected where passing through bulkheads or partitions by the use of rubber grommets (or equivalent) or bulkhead fittings.

5 Free from stresses due to relative movement between the piping and the support structure.

6 At least 25 mm from any electrical service.

7 Protected from abrasion.

(Any 6, 1 mark each) (6 marks)

(b) 1 All joints, unions, shut off valves and hoses are to be readily accessible.

2 Branch pipes should enter directly below or as close as practicable to the gas appliance they serve.

3 Copper branch pipes shall have a loop in them to absorb vibration and expansion.

4 Where the pipe work lies along the chassis it must be fastened to the side of it, not beneath it.

(Any 3, 1 mark each) (3 marks)

- (c) 1 Rigid piping must be protected from direct contact with metallic parts of the structure.
- 2 Rigid piping must be at least 100 mm from exposed live parts of electrical fittings.
- 3 Wherever possible pipe work shall be constructed from continuous lengths of pipe from the regulator to branch points and from these points to the appliance main control valve.
- 4 Where piping passes through an engine room space or sleeping accommodation space continuous piping shall be used and adequately supported.

(Any 3, 1 mark each) (3 marks)

- (d) The piping shall not be used as an earth electrode or earth continuity conductor.  
Metallic pipes shall be bonded to the earth continuity conductor.

(2 marks)

**Total 14 marks**

### **ANSWER 3**

ANY SIX:

- Access for maintenance,
- Availability of air for ventilation and combustion,
- Disposal of products of combustion,
- Access to a drain for water from appliance,
- Proximity to major hot water outlets,
- Separation from combustibile material,
- Isolation from flammable vapours, etc.,
- Accessibility to a gas supply.

(Any 6, ½ mark each)

**Total 3 marks**

### **ANSWER 4**

- (a) Bedrooms  
Bathrooms  
Saunas  
Toilets  
Spa rooms

(½ mark each) (3 marks)

- (b) Must be at least 1.5m from a doorway if a space heater is to be used 300mm above ground level if outside

Pointed downwards to avoid ingress of dust, dirt or water

(1 mark each) (2 marks)

- (c) (i) Check the Energy Safety (ES) website to ensure that it is an approved system for use with gas or that a supplier declaration is available.

(1 mark)

- (ii) It must be installed as a complete entity in accordance with the manufacturer's instructions.

(1 mark)

**Total 7 marks**

**ANSWER 5**

(a)  $250 \times 96 \div 3.6 = 6666.667$  (1 mark)

Therefore the cost per kWh  $= \frac{283}{6666.667}$

$= 0.0425$  cents. (1 mark)

(2 marks)

(b) Total litres of hot water daily  $= 430 + 140$

$= 570$  (1 mark)

Gas input  $= 55 + 43 = 98$ kWh (1 mark)

Gas input /litre  $= \frac{98}{(18 + 14)}$

$= 3.063$ kWh (1 mark)

Daily gas input  $= 570 \times 3.063$

$= 1745.91$ kWh (1 mark)

Therefore the daily cost  $= 1745.91 \times 0.0425$

$= 74.2$ c (1 mark)

Therefore the monthly cost  $= 74.2 \times 31$

$= 2300.2 \div 100$

$= \$23.00$  (1 mark)

GST  $= 2.88$

Total  $= \$25.88$  (1 mark)

(7 marks)

**Total 9 marks**

## ANSWER 6

- (a) • Deprive the gas appliance of air required for combustion.  
• Deprive the gas appliance of dilution air for the draught diverter.  
• Cause the air pressure to vary from atmospheric at the gas appliance.  
• Spillage of products of combustion.  
• Flame interruption  
(Any 3, 1 mark each) (3 marks)
- (b) 1 Combustion air must be ducted from outside.  
2 The flue must terminate outside.  
(2 marks)
- (c) 1 A burner fan interlock with the gas supply.  
2 A high limit switch to shut the gas supply off if safe temperature limits are exceeded.  
(2 marks)
- (d) 1 The duct must have a smooth interior surface.  
2 The duct must discharge outside the building.  
3 If more than 900mm long an access opening must be provided near the appliance for lint removal.  
(Any 2, 1 mark each) (2 marks)

**Total 9 Marks**

## ANSWER 7

- (a) Need for good ventilation  
Avoid overheating of surrounding furnishings.  
Rated to suit room size  
(Any 2, 2 marks)
- (b) Fitted with a flame failure device.  
Have an effective flue.  
Adequate permanent ventilation  
All room sealed  
(Any 2, 2 marks)
- (c) Incomplete combustion  
Flame lift off  
Loss of Efficiency  
(Any 2, ½ mark each) (1 mark)

(d) Joint must be welded or brazed  
Joint must be tested and proved sound before concealment (1 mark)

e) 1200 mm clearance above the highest burner  
200 mm horizontal clearance from the periphery of any burner. (2 marks)

**Total 8 Marks**

### ANSWER 8

(a) 1 Rooms used for sleeping.  
2 Rooms usually kept closed.  
3 Bathrooms. (3 marks)

(b) Room volume =  $4.5 \times 3.1 \times 2.4$   
=  $33.48\text{m}^3$  (1 mark)  
Max. input =  $33.48 \times 0.2$   
=  $6.696\text{MJ}$  (1 mark)  
No. of lights =  $\frac{6.696}{0.396}$   
=  $16.909$   
= 16 (1 mark) (3 marks)

**Total 6 Marks**

### ANSWER 9

(a) A secondary heat exchanger is used so that the incoming (return) water cools the flue gases from the combustion process thus causing the condensation of the water vapour it contains. The heat removed from the flue gases is transferred to the incoming water. (3 marks)

(b) 1 Improved efficiency.  
2 Lower flue temperatures allow the use of PVC flues.  
3 The use of a fan for expelling flue gases allows for flexibility in locating the boiler. (3 marks)

- (c) 1 A drain pipe must be fitted to remove the condensate to a suitable discharge point.
- 2 Relative parts of the boiler must be manufactured from corrosion resistant materials as the condensate is mildly acidic.
- 3 Because flue gas temperature is so low a fan will be required to expel it.
- 4 The heat emitters in the heating system may need to be increased in size due to the requirement for a lower returning water temperature to aid the condensation process.

(Any 3, 1 mark each) (3 marks)

- (d) 1 The ambient air temperature.
- 2 The relative humidity.

(2 marks)

**Total 11 Marks**

### ANSWER 10

- (a) When AC supply is passed to an electrode positioned in a flame only a DC supply passes through the flame to earth. (Rectification).

When the flame is established the DC flow is detected and passed to the controller. When the flame is extinguished the DC flow stops and the controller shuts the gas off.

(3 marks)

- (b) Orifice – To allow a greater flow for less differential pressure (2 marks)

Spring – To provide greater resistance to valve movement (2 marks)

(4 marks)

- (c) Inspiration – Gas at high pressure induces air at low pressure into the burner mixer.

Aspiration – Air at high pressure induces gas at low pressure into the burner mixer.

(2 marks)

- (d) Shut the boiler down and fit a test gauge between the double block valves.

If the pressure increases the first block valve is leaking.

If the first valve is tight then pressurise the space between the double valves and monitor the pressure.

If the pressure falls the second block valve is leaking.

(4 marks)

**Total 13 Marks**

## ANSWER 11

(a) • Excessive draught: (1 mark)

Increases stack temperature resulting in decreased combustion efficiency. (1 mark)

• Insufficient draught: (1 mark)

Can result in condensation, carbon monoxide formation, flue gas spillage and production of soot.

(1 mark)

(b) • The air supply to the gas appliance and surroundings

• The internal velocity

• The requirement for a damper

• The sizing of the fan

• Fan failure sensing devices

• Noise and vibration minimisation.

(Any 4, 1 mark each)

**Total 8 Marks**

## ANSWER 12

1 There must be sufficient air for complete combustion of the gas.

2 There must be sufficient air for proper operation of the flue.

3 There must be sufficient air to prevent overheating of the immediate surroundings.

**Total 3 Marks**





