*Plumbers, Gasfitters & Drainlayers Board*

**No. 9193**

# *Examiner's Report and Marking Schedule 2003*

**GASFITTING**

## Registration/ Craftsman

*The answers in this Marking Schedule are not necessarily the only correct answers. Alternative answers that are not covered by the Marking Schedule will be judged on their merit, and marked accordingly.*

**MARKING SCHEDULE,**
**PAPER 9193**

## QUESTION 1

(a) Hole positioned **in middle third** of the depth of the joist
Not more than **three times the depth of the joist from the face of the support.**
**Diameter not to exceed 20%** of the depth of the joist or 32 mm, whichever is the smaller.

(3 marks)

(b) Pipe shall be **metal and wrapped**
Concrete **cover shall be appropriate**
**Minimum number of joints** and any must be brazed or welded
Placed to **avoid interference with any reinforcing**
Pipe shall **not reduce the strength of the slab**
Piping shall **not extend through expansion joints**
**In accordance with pipe manufacturer's instructions**
Limited to 7 kPa opertation

(ANY SIX – 1 mark each) (6 marks)

(c) **Protected against corrosion**
**Sealed at the wall**
**Not subjected to any loading** from building or settlement
**Allowance for expansion**
**Sealed to vapour barrier**

(ANY THREE – 1 mark each) (3 marks)

(d) Parallel male threaded fittings
Square back elbows
Long screw connectors
Internally threaded PVC fittings
Compression fittings with non-metallic olives

(ANY FOUR – ½ mark each) (2 marks)

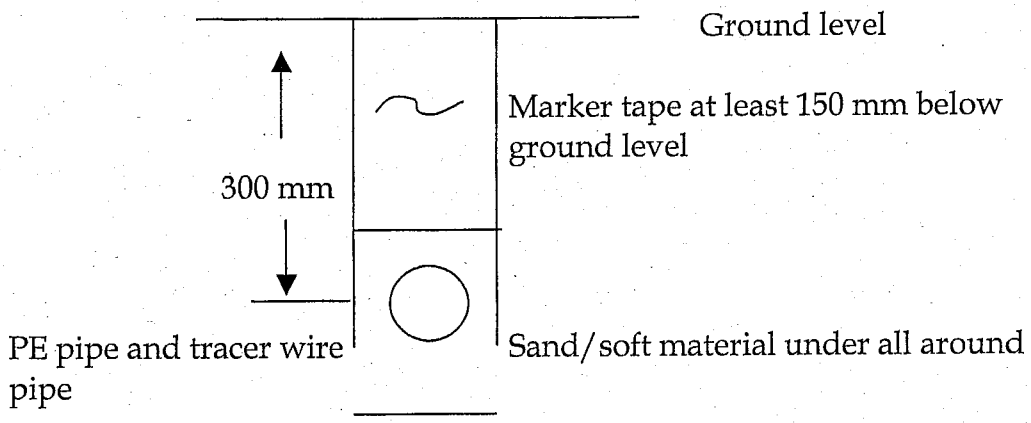
(e) To avoid internal erosion of the pipework
To prevent excessive noise from pipework

(EITHER, 1 mark) (1 mark)

(Total 15 marks)

## QUESTION 2

(a)




(3 marks)

(b) **Does not corrode**
Long lengths and thus **fewer joints**
Lighter and **more flexible to handle**
**Non-conducting** material
**Cost effective**

(ANY THREE – 1 mark each) (3 marks)

(c) Quarter turn **isolating valve to shut off gas supply**
**Filter to trap any dust in the gas and prevent damage**
Pressure **regulator to control pressure in installation**
**Overpressure** shut off/relief **valve to protect installation**
**Gas meter to measure consumption**

(ANY FOUR – 1 mark each) (4 marks)

(Total 10 marks)

## QUESTION 3

(a) Ventilation is required to reduce the gas/air mixture below the lower explosive limit as quickly as possible.

(2 marks)

(b) Efficiency is calculated by dividing the heat output of an appliance by the heat input and expressing it as a percentage.

(2 marks)

(c) The flame become luminous, yellow, floppy and may be smoky and deposit soot.

(2 marks)

(d) At high altitudes the atmospheric pressure is lower and so the gas expands to occupy a larger actual volume.

(2 marks)

(e) Upper limit: 15% gas in air
Lower limit: 5% gas in air

(2 marks)

(f) Being **heavier** than air, the LPG **falls to low levels**.

(2 marks)

(g) The **contamination of the air supply** by products of combustion to a gas burner causing **incomplete combustion**.

Causing:

- flame lift off
- noise
- unstable flame

(3 marks)

(Total 15 marks)

## QUESTION 4

(a) Heat input to room = $80 \times 0.36 = 28.8$ MJ/h (1 mark)

Heat input to appliance = $28.8/0.7 = 41.1$ MJ/h (1 mark)

Gas rate = $41.1/95 = 0.43$ $m^3/h$ (1 mark)

(b) Room volume = $4.8 \times 3.5 \times 2.7 = 45.36$ $m^3$

Heat input = Room vol $\times$ 0.36 = $45.36 \times 0.36$

= **16.33 MJ/h** (3 marks)

(c) Volume of room = $4.0 \times 3.8 \times 2.7 = 41.04$ $m^3$

Heat input = $41.04 \times 0.36 =$ **14.77 MJ/h**

(2 marks)

(Total 8 marks)

## QUESTION 5

| Control | Type | Purpose |
|---|---|---|
| Flame failure device | Thermoelectric | Monitor pilot flame and shut off pilot and main burner if flame failure |

| | | occurs |
|---|---|---|
| Thermostat | Snap acting/rod and tube | Senses the temperature of the water and controls the gas burner |
| Pilot adjustor | Needle valve | Adjusts the size of the pilot flame |
| Energy cut-off device | B1 – metal | Safety shut-off for gas if thermostat fails and water overheats. |

½ mark each for type
½ mark each for purpose

(4 marks)

**QUESTION 6**

(a) Flue installed through roof
Ventilation at high and low level
Gas supply to appliance
Fireproof base to support heater
Clearance from combustibles
(Any FOUR – 1 mark each)

(4 marks)

(b) **Radiant panel or tube** heater **suspended above work area** and radiating downwards. Heats **only the people and equipment** in direct line and not the surrounding air.

(3 marks)

(c)

| **Period** | **Equipment in operation during period** | **Pilot gas valve (open/shut?)** | **Main gas valve (open/shut?)** |
|---|---|---|---|
| Pre-purge | Fan | Shut | Shut |
| Start flame ignition | Fan and igniter | Open | Shut |
| Start flame | | | |

| | | | |
|---|---|---|---|
| proving | Fan and FFD | Open | Shut |
| Main flame establishment | Fan and FFD | Open | Open |

(Table must be totally correct – no part marks) (6 marks)

(Total 13 marks)

**QUESTION 7**

(a) (i) To establish that combustion fan is running before gas is turned on and to shut burner down if fan fails

(2 marks)

(ii) Two safety shut-off valves are provided; they give a check on isolation and to ensure gas control back-up should one fail

(2 marks)

(iii) To allow the pressures to be set separately and to ensure that the pressures remain constant to both main and pilot burner.

(2 marks)

(b) The PCU **controls the ignition** and **flame detection** devices to ensure safe operation. It controls **purge times,** ignition times and flame proving. It also ensures rapid shut down if a fault occurs.

Any FOUR:

- Controls ignition
- Flame sensing
- Fan proving
- Purge times
- Safety shut off

(4 marks)

(Total 10 marks)

## QUESTION 8

(a) for dilution purposes
to prevent excessive pull on the primary flue
to prevent any down draught smothering the flame
for lowering flue gas temperature
for preventing condensation

(ANY THREE - 1 mark each) (3 marks)

(b) The secondary flue pipe is the section of the flue pipe system between the downdraught diverter and the flue pipe cowl.

(2 marks)

(Total 5 marks)

## QUES TION 9

(a) **Isolate any appliances** and seal all open ends
Fit a test piece and **connect a gauge**
**Pressurise to test pressure**
**Allow to stabilise** for 2 minutes
Isolate pressure source and **commence to time test**
Gas tight if **no pressure loss in next 5 minutes**

(6 marks)

(b) Pilot turned off
All appliance control valves closed
All isolating valves open

(all 3 required for mark) (3 marks)

(c) (i) a pipework test = 1½ WP or 2.25 kPa
(ii) an installation test = 2.0 kPa
(iii) a leakage test = 2.0 kPa

(3 marks)

(Total 12 marks)

**QUESTION 10**

(a) As the **products of combustion are discharged into the living room** they can **reduce the level of oxygen,** causing **incomplete combustion** and **producing carbon monoxide.**
(½ mark each) (2 marks)

(b) 25 mm (1 mark)

(c) (i) A flue cowl (1 mark)

(ii) Prevent down draught
Prevent moisture from entering the flue
Prevent entry of birds etc

(ANY TWO - 1 mark each)

(2 marks)

(Total 6 marks)

**QUESTION 11**

Free-standing space heaters are required to be seismically restrained in case of earthquake. This must be carried out in accordance with manufacturer's specifications.

(Total 2 marks)