No. 9195

Plumbers,
Gasfitters and
Drainlayers Board

CRAFTSMAN EXAMINATION, NOVEMBER 2008

PLUMBING

ANSWER SCHEDULE

ANSWER 1

(a) (i) The work is limited to repairs and maintenance using comparable materials, or replacement with a comparable component or assembly in the same position.

(ii) The opening and reinstatement of any purpose-made access point within a drainage system.

(2 marks)

(b) The repair or replacement of any storage water heater connected to an un-controlled heat source
Or
Any valve-vented water heater

(3 marks)

(c) 1. To issue building consents.

2. To inspect building work for which it has issued a consent.

3. To issue notices to fix.

4. To issue code compliance certificates.

5. To issue compliance schedules.

6. Carrying out other functions and duties specified in the Building Act.

(Any 4, 1 mark each) (4 marks)

(d) 12 months.

(1 mark)

Total 10 marks

ANSWER 2

(a) (i) Litres/m = 5000 ÷ 60 (1 mark)
= 83.333

Friction head = (5 ÷ 100 × 8) + 8 (1 mark)
= 0.4 + 8

Total suction lift = 8.4m (1 mark)

(3 marks)

(ii) Static delivery head = 9m
Delivery pipe length = 26 + 9
= 35m

Demand = 83.333 litres (1 mark)

Total delivery head = (3.2 ÷ 100 × 35) + 9
= 1.12 + 9
= 10.12m (1 mark)

(2 marks)

(iii) Total working head = 8.4m + 10.12m
= 18.52m

(1 mark)

(b) $Q = 0.03 \times 12 + 0.4554\sqrt{12}$
$= 0.36 + 0.4554 \times 3.464$
$= 0.36 + 1.578$
$= 1.938$ l/s

(2 marks)

Total 8 marks

ANSWER 3

(a)
- Containment
  One backflow prevention device may be required at the property boundary to protect the public water supply

  (1 mark)
- Zone protection
  Protection provided at the connection to specified sections of a plumbing system within a building or facility.

  (1 mark)
- Individual
  Protection provided at the connection point of a fixture or an appliance.

  (1 mark)

(3 marks)

(b)
1. Between a potable water supply system and a non-potable water supply system.
2. Between a potable water supply system connected to a water main and any water from another source including a private water supply.
3. Between a potable water supply system and any bathing facilities including swimming, spa or paddling pools.
4. Between a potable water supply system and pipes, fixtures or equipment (including boilers and pumps) containing chemicals, liquids, gases or other non-potable substances.

(3 marks)

ANSWER 3 (cont'd)

(c) Nothing would happen in the static condition, as no flow would be occurring.

(1 mark)

(d) 1. A break in the water main causing a loss of pressure would need to occur below any source of contamination.

2. Excessive draw-off in the main creating a vacuum.

(2 marks)

Total 9 marks

ANSWER 4

(a) 1. At all bends or junctions.

2. At the termination of piping.

3. At valves installed in the piping.

4. At the reducing fitting in the direction of the smaller pipe.

5. At changes of direction in excess of 5º.

6. At grades in excess of 1:5.

7. In accordance with the manufacturer's instructions.

(Any 5, 1 mark each) (5 marks)

(b) (i)
- All pipes and fittings must be buried to a minimum depth of 300mm or
- The pipework must be covered with waterproof insulation or
- The pipework must be provided with heat tracing.

(Any 2, 1 mark each) (2 marks)

(ii)
- In unheated roof spaces.
- In unheated cellars.
- Locations near windows, ventilators or external doors where cold draughts are likely to occur.
- Locations in contact with cold surfaces such as metal roofs, metal frame work or external metal cladding materials.

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

Total 10 Marks

ANSWER 5

(a) $D = \frac{24000 \times 32 \times 0.66}{115}$

$= 4407.65$ litres

(2 marks)

(b) Litres/ min = 24000 ÷ (24 × 60)

= 16.66

Therefore a model no.2 ram is required.

(2 marks)

Total 4 Marks

ANSWER 6

(a) Showers: 17 × 0.03 × 60 × 60 = 1836 (1 mark)

Basins: 4 × 0.03 × 60 × 60 = 432 (1 mark)
= 2268

Add 10 % 226.8

Total storage 2494.8 litres (1 mark)

(3 marks)

(b) Temp. rise = 70 – 8 = 62 ºC.
Heating time = 8.5 hours

$\frac{2494.8 \times 4.2 \times 62}{1000 \times 3.6 \times 8.5}$ (1 mark)

$= \frac{649645.92}{30600}$

= 21.230 kWh (1 mark)

Efficiency 95%: $= \frac{21.230 \times 100}{95}$

= 22.348 kWh (1 mark)

(3 marks)

(c). Temp.rise cold to hot = 70 – 8 = 62 ºC
Temp.rise cold to mixed = 42 – 8 = 34 ºC

2494.8 × 62 = litres mixed × 34

Therefore litres mixed $= \frac{2494.8 \times 62}{34}$ (1 mark)

$= \frac{154677.6}{34}$

= 4549.341 litres (1 mark)

= 4549.341 – 2494.8

= 2054.541 litres. (1 mark)

(3 marks)

Total 9 Marks

ANSWER 7

(a) Relief valve drains shall:

- Have no restrictions or valves.
- Have a continuous fall from the relief valve to the outlet.
- Discharge in a visible position, which does not present a hazard or damage to other building elements.
- Have a minimum diameter of the same size as the valve outlet.
- Have the sum of the number of changes in direction plus the length of pipe (in metres) not exceeding 12.
- Be connected to a relief valve in accordance with the valve manufacturer's specification.
- Be made of copper pipe.

(Any 5, 1 mark each) (5 marks)

(b) Where freezing is likely:

- Relieve one valve only.
- Relief valve drainpipes shall discharge over a tundish with a 25mm air break before the drainpipe enters a zone where freezing is likely.
- Relief valve drains from a tundish shall be one size larger than the outlet diameter of the relief valve.

(1 mark each) (3 marks)

(c) Where relief valve drains are combined, the combined drain shall:

- Receive discharges from the temperature/pressure relief valve or the pressure relief valve via an air-break, and
- Be sized to be greater or equal to the size of the largest valve drain.

(1 mark each) (2 marks)

Total 10 Marks

ANSWER 8

(a) 1. It must be located not less than 300mm above the highest outlet (measured from the highest outlet to the lowest point of the valve body).

2. It must be installed vertically with the air ports at the top.

3. It must have free ventilation to the air ports at all times. (3 marks)

(b) The spring should register a pressure of 35 kPa or over. (1 mark)

(c) 1. By way of an air gap over rim water supply or in the supply tank serving the hot and cold water supplies serving only the bidet.

2. By high hazard backflow prevention devices fitted to each of the hot and cold water supplies serving only the bidet.

(2 marks)

Total 6 Marks

ANSWER 9

(a) $H = \frac{112}{9.81} + 1$

$= 12.417m$

(2 marks)

(b) $12.417 – 0.4 = 12.017m$
$12.017 \times 9.81 = 117.887\ kPa$

(2 marks)

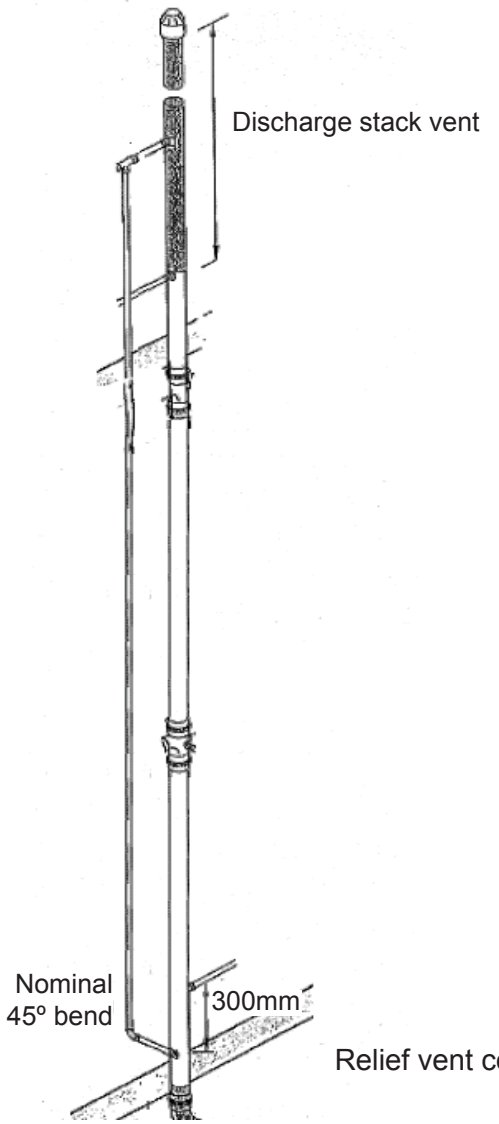
Total 4 Marks

ANSWER 10

(a) A relief vent is fitted to a waste stack to balance the air pressure in the stack,
To prevent water trap seals on sanitary fixtures being disturbed by the flow of water within the soil stack or waste stack.
To allow an increase in the number of discharge units.

(Any 2, 1 mark each) (2 marks)

(b)



Relief vent termination (1 mark)
Relief vent connection 300mm below lowest fitting entry (1 mark)
Restricted zone (1 mark)

(3 marks)

ANSWER 10 (cont'd)

(c) (i) 1·25%

(1 mark)

(ii) They must be interconnected above the flood level rim of the highest fixture or floor waste gully served by the vent.

(2 marks)

(iii)
- Vent pipes from waste fixtures discharging into disconnector gullies.
- Chamber or steam relief vents from bedpan sanitizers and washers.
- Vent pipes from arrestor chambers.
- Vent pipes from gullies located within buildings.

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

Total 11 Marks

ANSWER 11

a) Effluent from the sink enters the grease converter over a filter/baffle causing the grease to form into globules which then float to the surface while the water discharges to the drainage system. A colony of micro organisms is produced to degrade and convert the grease globules to water soluble products acceptable for discharge to the foul water drainage system.
Regular dosing of the grease converter is necessary for its correct operation.

(4 marks)

(b) The grease converter must be able to accept the maximum discharge volume that can occur from the connected fittings and appliances at any one time.

(2 marks)

(c)

Type of fixture	Fixture volume (litres)	Quantity	Total Volume
Wash hand basin	12	4	48
Domestic sink	32	–	–
Dom. Double sink	64	–	–
Commercial sink	81	2	162
Com. Double sink	162	1	162
Com. Pot-wash sink	144	1	144
Tilting kettle	150	–	–
Small dishwasher	185	–	–
Med. dishwasher	235	1	235
Large dishwasher	350	–	–
Other fixtures		–	–
			751 litres

(½ mark each) (3 marks)

Total 9 Marks

ANSWER 12

(a) Any FOUR:

- The compatibility of the new metal roofing material.
- The gradient/fall of the existing roof.
- The suitability of the roof material for the conditions
- The spacing of roof fixing may have an impact on the choice of roof material.
- Compatibility of profile
- Wind loading

(1 mark each) (4 marks)

(b) $\frac{96}{8}$ = 12m per section

Temperature difference = 30 - 4 = 26ºC (½ mark)

Allowance for expansion per section

= 12 x 26 x 0.000012 (½ mark)

= 0.003744 x 1000

= 3.744mm (1 mark)

(2 mark)

Total 6 marks

ANSWER 13

Testing of above ground non-pressure PVC waste and soil pipes shall be carried out as follows:

1. All openings below the top of the section being tested shall be sealed

(1 mark)

2. The water level in the pipework shall be raised to a height of not less than 3 metres above the highest point of the section being tested or such additional height as an inspecting officer may direct conditional upon the maximum pressure at the lowest end of the section of pipework being tested not exceeding 6 metres head of water.

(2 marks)

3. Each joint shall then be visually examined for leaks, and the installation passes the test if there is no evidence of a leak and the water level remains constant.

(1 mark)

Total 4 marks