No. 9195

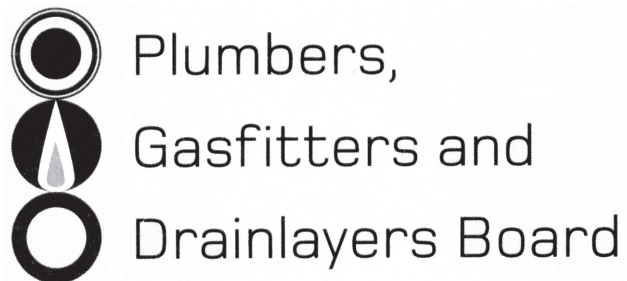**Plumbers, Gasfitters and Drainlayers Board**

CRAFTSMAN EXAMINATION, NOVEMBER 2009
PLUMBING

ANSWER SCHEDULE

ANSWER 1

NZS 3604:1999 relates to timber framed buildings.
It is important that provision is made within the building for the plumbing systems.
It is important that such systems do not weaken the structural integrity of the building.   (1 mark each)

Total 2 marks

ANSWER 2

(a) • Into the safe tray, directly over the safe tray overflow outlet.
    • Directly into the safe tray overflow.
    • Onto an impervious graded floor, so that the entire discharge drains freely and harmlessly to a floor waste outlet.
    • Outside the building, clear of doors, windows or other openings, and within the property boundaries.

(3 marks)

(b) 1.25 h = 75 m = 4500 seconds   (1 mark)
    25000 ÷ 4500 = 5.556 l/s   (1 mark)
    Therefore a 20 mm inlet orifice is required.   (1 mark)

(3 marks)

Total 6 marks

ANSWER 3

(a) • They must be installed in the service pipe in duplicate and in parallel, each valve shall be separately sized to cater for the total simultaneous demand.
    • They must be controlled by means of stop valves, installed at both the inlet and outlet of each ratio valve, which under normal operating conditions shall be fully open.
    • They must be installed in an accessible position and not subject to interference.
    • They must be readily removable by means of flanges or unions.
    • They must be not less than the diameter of the pipe section in which they are installed.

(1 mark each, 5 marks)

(b) $3.500 \times 3.500 \times 0.7854 \times 2.500$ = 24.053 m³   (½ mark)
    $2.800 \times 2.800 \times 0.7854 \times 2.200$ = 13.547 m³   (½ mark)
    $0.080 \times 0.080 \times 0.7854 \times 2.500$ = 0.013 m³   (½ mark)
    $0.050 \times 0.050 \times 0.7854 \times 24.000$ = 0.047 m³   (½ mark)
                                                          37.660 m³   (½ mark)

    $\dfrac{37.660 \times 1000 \times 400}{1000}$ = 15064 ml   (1 mark)

                                                          = 15.064 litres   (½ mark)   (4 marks)

(c) Any FOUR, 1 mark each
    • The type of usage likely to occur.
    • The nature and temperature of the water to be conveyed and the risk of corrosion and leaching.
    • The nature of the environment and the ground and the possibility of chemical attack or permeation.
    • The physical and chemical characteristics of the materials and products.
   • Frost protection.

(4 marks)

Total 13 marks

ANSWER 4

(a) • The craftsman is <u>involved in planning the job</u> <u>and gives clear directions</u> to the registered person as to how the job is to be done.
   • The craftsman maintains supervision of the job to the extent that he or she is satisfied that the <u>job meets the requirements of the customer</u>, is done in accordance with sound trade practice and <u>complies with the appropriate installation codes</u>.
   • The craftsman assumes the responsibility and accountability to the customer, the Territorial local Authority and/or the Board <u>for all aspects of the work</u>.

(3 marks)

(b) Any THREE, 1 mark each
   • Supervision requires the supervisor to <u>make their own assessment of a particular job</u> by attending the site, or giving appropriate instructions, and <u>approving what the limited certificate holder proposes to do</u>.
   • The supervisor is <u>not required to be continuously present</u> while the work is being undertaken.
   • The supervisor must <u>attend the job on a basis that is sufficient to satisfy</u> the supervisor that <u>all phases of the job, especially critical testing phases, have been correctly carried out</u>.
   • On completion of the work, <u>the supervisor must take responsibility</u> for sound trade practice and <u>compliance of the work both under statutory authority and with the consumer</u>.

(3 marks)

(c) The non-apprentice limited certificate holder must work <u>under the direct supervision and in the presence</u> of the supervisor who must be a <u>craftsman or registered plumber</u>.

(2 marks)

Total 8 marks

ANSWER 5
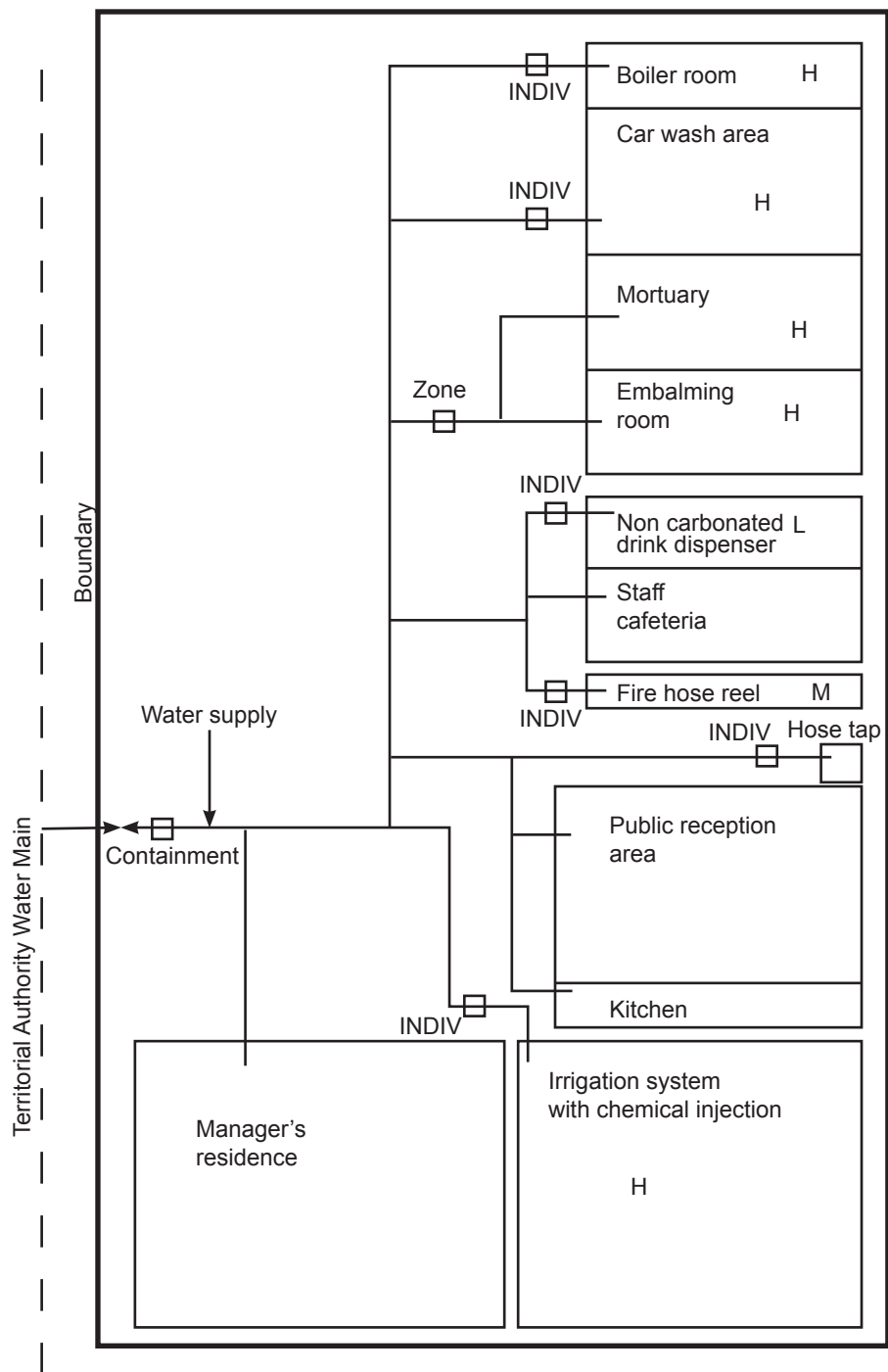
(a) ½ mark each (4 marks)

(b) ½ mark each (4 marks)

(c) 1 mark

(d) 2 marks

Total 11 marks

ANSWER 6

(a)   (i)   470 l/m
      (ii)   100mm

(b)   (i)   378 l/m
      (ii)   80mm

(c)   (i)   1325 l/m
      (ii)   150mm

(d)   (i)   946 l/m
      (ii)   125mm

(½ mark each)

Total 4 marks

ANSWER 7

(a)

Typical flow rates of hot water demand at the outlet of fittings			
Fitting	**Flow rate**		
Shower	0.1 L/s	24 × 0.1	2.4
Handbasin	0.1 L/s	24 × 0.1	2.4
Kitchen sink	0.2 L/s	24 × 0.2	4.8
Clothes washer	0.2 L/s	24 × 0.2	4.8
Dishwasher	0.2 L/s	24 × 0.2	4.8
TOTAL			19.2 L/s

(½ mark each line)

(b)   0.5 × 63 = 0.9 × temp. rise cold to mixed
     Temp rise cold to mixed = $\dfrac{0.5 \times 63}{0.9}$ (1 mark)

                         = 35ºC   (1 mark)

(2 marks)

(c)   Transpose formula:
     Time = $\dfrac{\text{mass of water} \times \text{specific heat of water} \times \text{temp. difference}}{1000 \times 3.6 \times \text{energy input}}$ (1 mark)

     = $\dfrac{200 \times 4.2 \times 63}{1000 \times 3.6 \times 3.5}$

     = $\dfrac{52920}{12600}$ (1 mark)

     = 4.2 × 1.025
     = 4.305 h   (1 mark)
     = 4 + (0.305 × 60)   (1 mark)
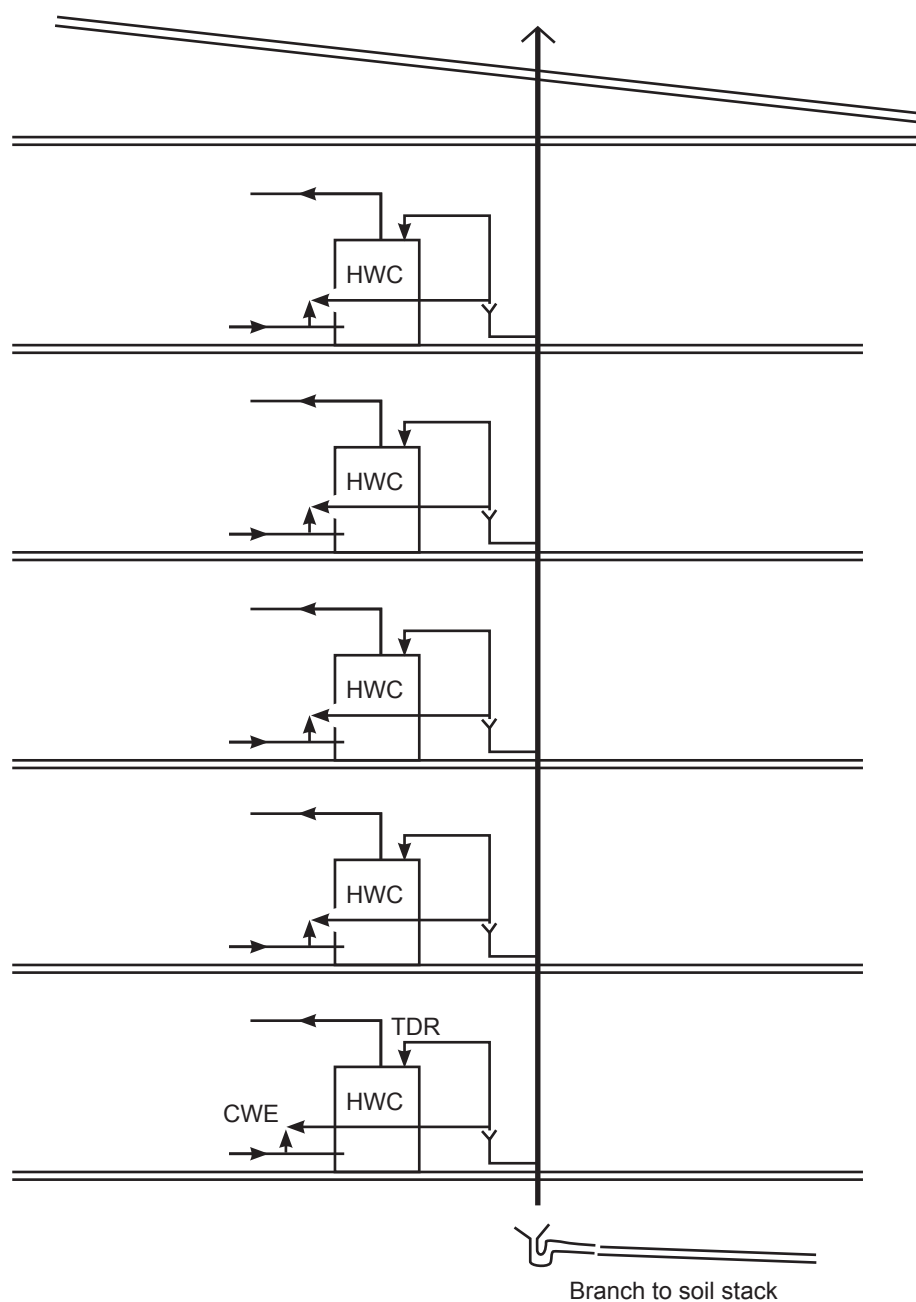   = 4 hours 18.3 minutes   (1 mark)

(5 marks)

Total 10 marks

ANSWER 8

Branch to soil stack

Total 4 marks

ANSWER 9

(a) 1. Reduce to a minimum the amount of dead (cold) water before hot water starts to flow at any outlet.
2. Be of sufficient size to give the required flow at all outlets.
3. Be the shortest practicable route for the main flow heated water pipes and branches to the outlets.
4. Be the minimum necessary diameter of the heated water pipes required to supply the outlet draw-off.
5. Provide a water velocity not exceeding 3 m/s.

(1 mark each, total 5 marks)

(b) • flow is proportional to number in bank, e.g. two heaters can give twice the flow of one heater, three heaters three times and so on.

   • all heaters undertake an equal work load.

   • equal and full recovery occurs after use.

   • any one unit can be isolated at any time leaving the rest in operation, thus avoiding long periods of disruption to the service.

   (Any 3, 1 mark each, 3 marks)

(c) • flow is limited to that obtainable from one heater.

   • the first heater in series does most of the work, the second and subsequent heaters may not operate other than to maintain losses.

   • higher standing, heat losses.

   • break down of one unit and removal for service closes down the whole operation.

   • A failure in one water heater will effect the operation of the whole system

   (Any 3, 1 mark each, 3 marks)

Total 11 marks

ANSWER 10

(a)
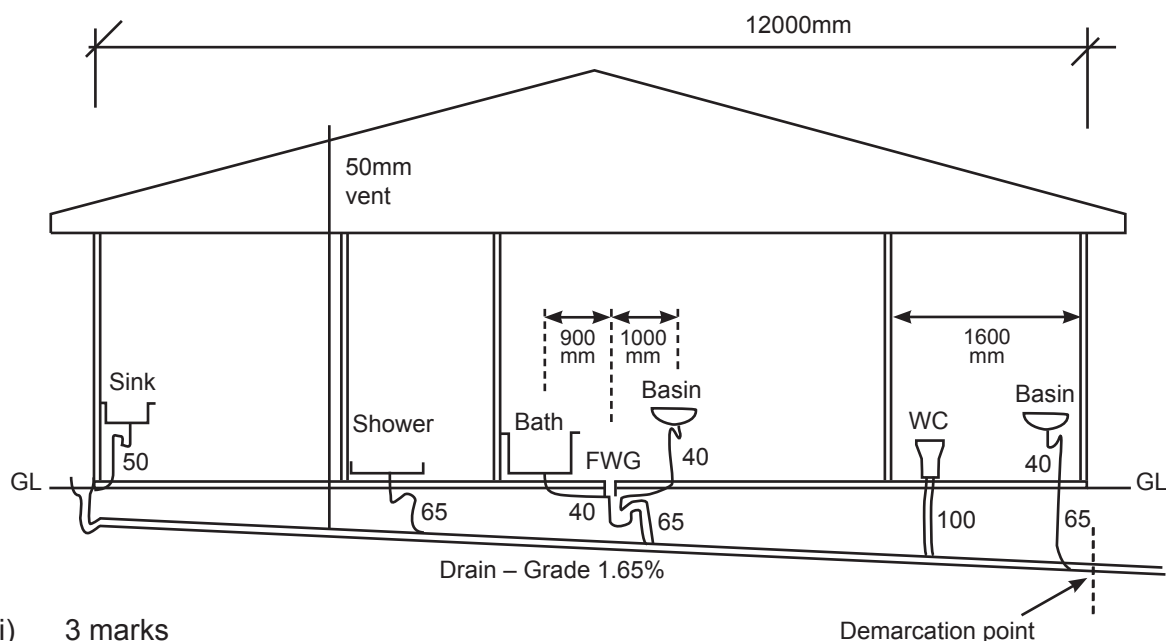
   (i)   3 marks
   (ii)   1 mark
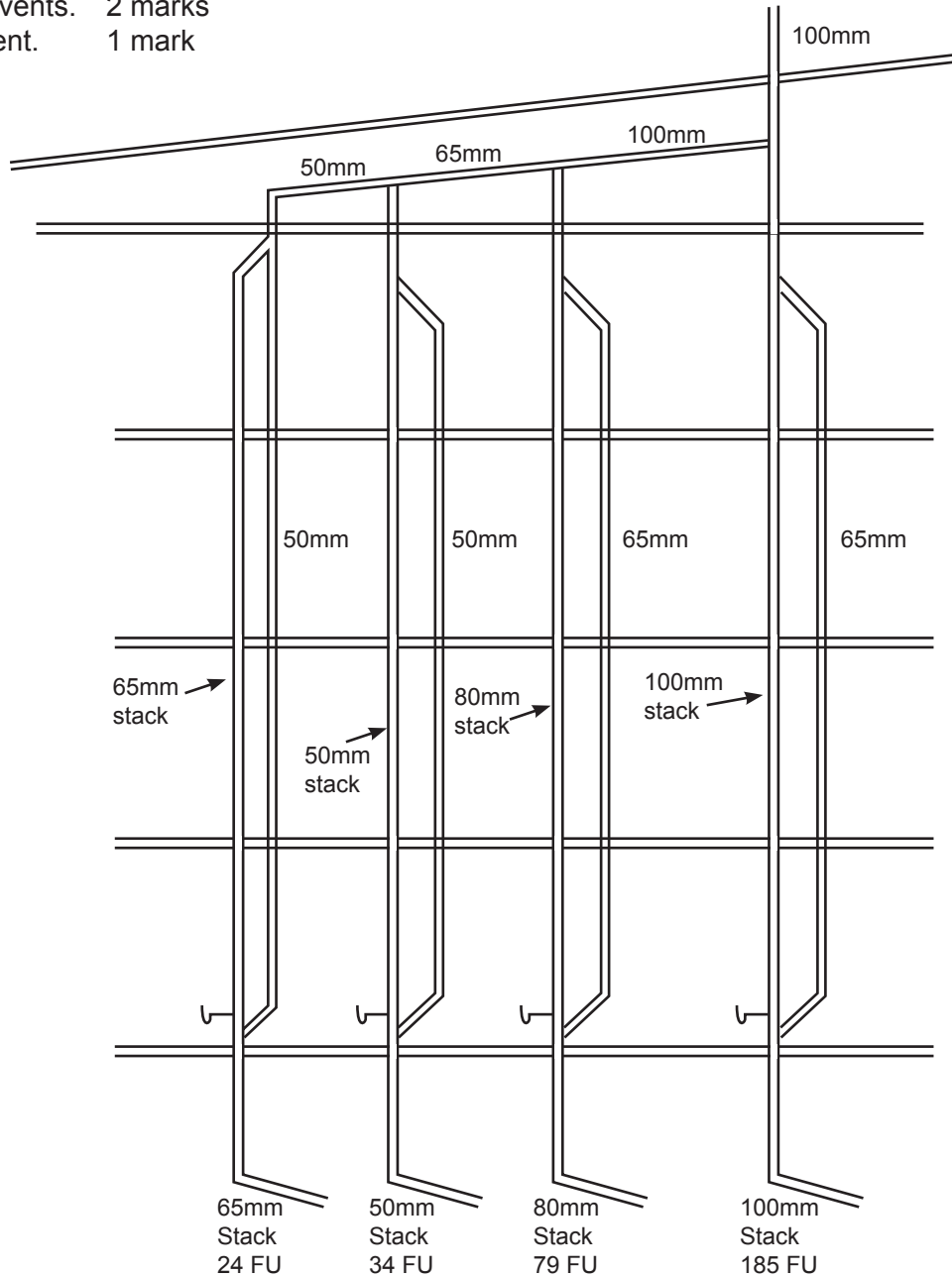   (iii) 1 mark
   (iv)   3 marks
   (v)   2 marks

(b)   12 ÷ 60 = 0.2 m   (1 mark)
      200 + 450 + 110 = 760 mm (accept 750 mm)   (1 mark)

   (Total 2 marks)

Total 12 marks

ANSWER 11

(a) Relief vents. 2 marks
     Header vents. 1 mark
     Stack vent. 1 mark

(b) Relief vents. 4 marks
     Header vents. 2 marks
     Stack vent. 1 mark

100mm

100mm

50mm   65mm   100mm

50mm   50mm   65mm   65mm

65mm
stack

50mm
stack

80mm
stack

100mm
stack

65mm
Stack
24 FU

50mm
Stack
34 FU

80mm
Stack
79 FU

100mm
Stack
185 FU

Total 11 marks

ANSWER 12

(a)   Any FOUR:
- Convey foul water from the building to a foul water drainage system.
- Avoid blockages.
- Avoid leakages.
- Prevent foul air and gases from entering the building.
- Enable access for maintenance and clearing of blockages.
- Avoid undue noise.

(½ mark each), (2 marks)

(b)
- The area of roof discharging to the gutter.
- The pitch of the roof.
- The local rainfall intensity in mm/h.

(Any 2, 2 marks)

(c)   All internal gutters must be fitted with overflows.

(1 mark)

(d)
- Overflow outlets must drain to the outside of the building.
- The top of the outlet or the spillage level of any weir shall be set at least 50 mm below the top of the gutter.
- The cross sectional area of the outlet shall be no less than the cross sectional area of the downpipes serving the gutter.
- An internal gutter overflow should be located so as to give an early and conspicuous warning to the building occupier that maintenance is required.

(Any 3, 3 marks)

Total 8 marks