



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

APRIL EXAMINATION

PLUMBING THEORY N2

25 MARCH 2014

This marking guideline consists of 8 pages.

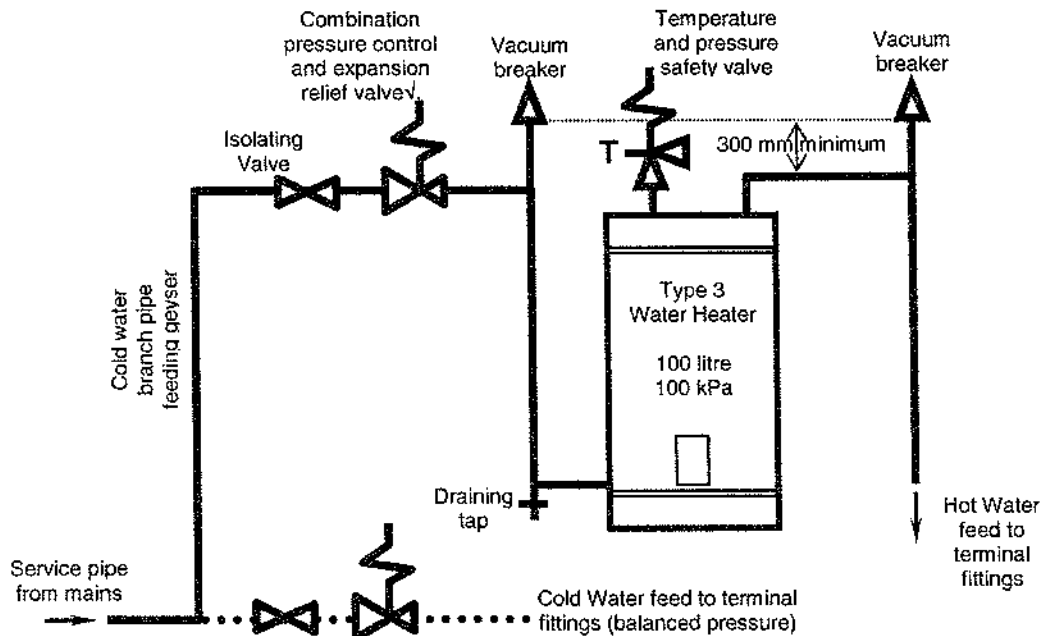
QUESTION 1: COLD-WATER SUPPLY

- 1.1
- Disease producing organisms of enteric (intestinal) origin.√
 - Toxic substances most frequently derived from industrial wastes but can also come from the careless use of insecticides etc.√
 - Biocides, even lead from lead pipes and lead containers.√
 - Color, usually flushed from the nature of soil strata it passes through√.
 - Turbidity generally carried in suspension by the erosion of clay deposits.√
 - Organic matter that produces odours and tastes such as the odor of hydrogen sulphide upon decomposition.√
 - Carbon dioxide that enables water to take up calcium, magnesium and lead into solution.√
 - Iron and manganese are taken into solution in the absence of dissolved oxygen.√
 - Algae, which release characteristic odors and tastes.√
 - Disinfecting chlorine, which may produce objectionable tastes unless chlorination is well managed.√
- (Any 4 x 1) (4)
- 1.2
- 1.2.1
- Injection aeration: - perforated pipes, diffusers, air lift pumps and other patented devices.√
 - Gravity aerators: - inclined planes, cascades, perforated traps√.
 - Pressure sprays or fountain aerators: - orifices, nozzles, etc.√
- (Any 2 x 1) (2)
- 1.2.2
- Removal or reduction of tastes and odor√
 - Removal or reduction of gasses such as carbon dioxide, methane and hydrogen sulphide√
 - To increase the pH level by removing carbon dioxide√
 - To add gasses to the water-
 - Oxygen to remove iron and manganese√
 - Carbon dioxide to remove excess lime√
- (Any 2 x 1) (2)
- 1.3
- More convenient means of access for the fire fighting teams√
 - Easy to locate√
 - Easy to maintain √
- (Any 2 x 1) (2)
- 1.4
- This system is more economical as far as installation costs, operating costs and maintenance costs are concerned. √
 - This system is more reliable and ensures a much more constant supply
The pump in a pump system must be interrupted to maintain or repair pumps. √.
 - A more constant pressure is ensured. The only fluctuations of pressure at terminal fittings will occur at peak demands and changes of the water level in the service reservoir.√.
- (Any 2 x 2) (4)

- 1.5 1.5.1
- When the vital layer becomes too thick, ✓
 - The rate of filtration decreases and ✓
 - The water head in the filter increases. ✓
 - At this stage the filtering media needs to be 'cleaned'. ✓
- (Any 2 x 1) (2)
- 1.5.2
- When the filter bed becomes choked, the filtering media is cleared by means of a process termed 'backwashing'. ✓
 - This is done by shutting off the supply of unfiltered water and opening the valve on the backwash pipe. ✓
 - Air at a low pressure is then blown into the filtering media through air nozzles at the bottom of the tank. ✓
 - The air disturbs the filter bed, thus loosening the impurities. ✓
 - Filtered water is then pumped back through the filtering media in an opposite direction to the normal direction of flow. ✓
 - All the silt and impurities are moved to waste via the backwash channel. ✓
- (Any 4 x 1) (4)
[20]

QUESTION 2: HOT-WATER SUPPLY

2.1



(8)

2.2

- Poor temperature control at mixer taps and shower outlets. ✓
 - The high pressure on the cold-water system increases the chances of pipe vibrations and water hammer. ✓
 - Noise levels are increased when cisterns and water tanks fill up through a ball valve. ✓
 - Splashing at water outlets are increased – especially in high-pressure areas ✓
- (Any 1 x 2) (2)

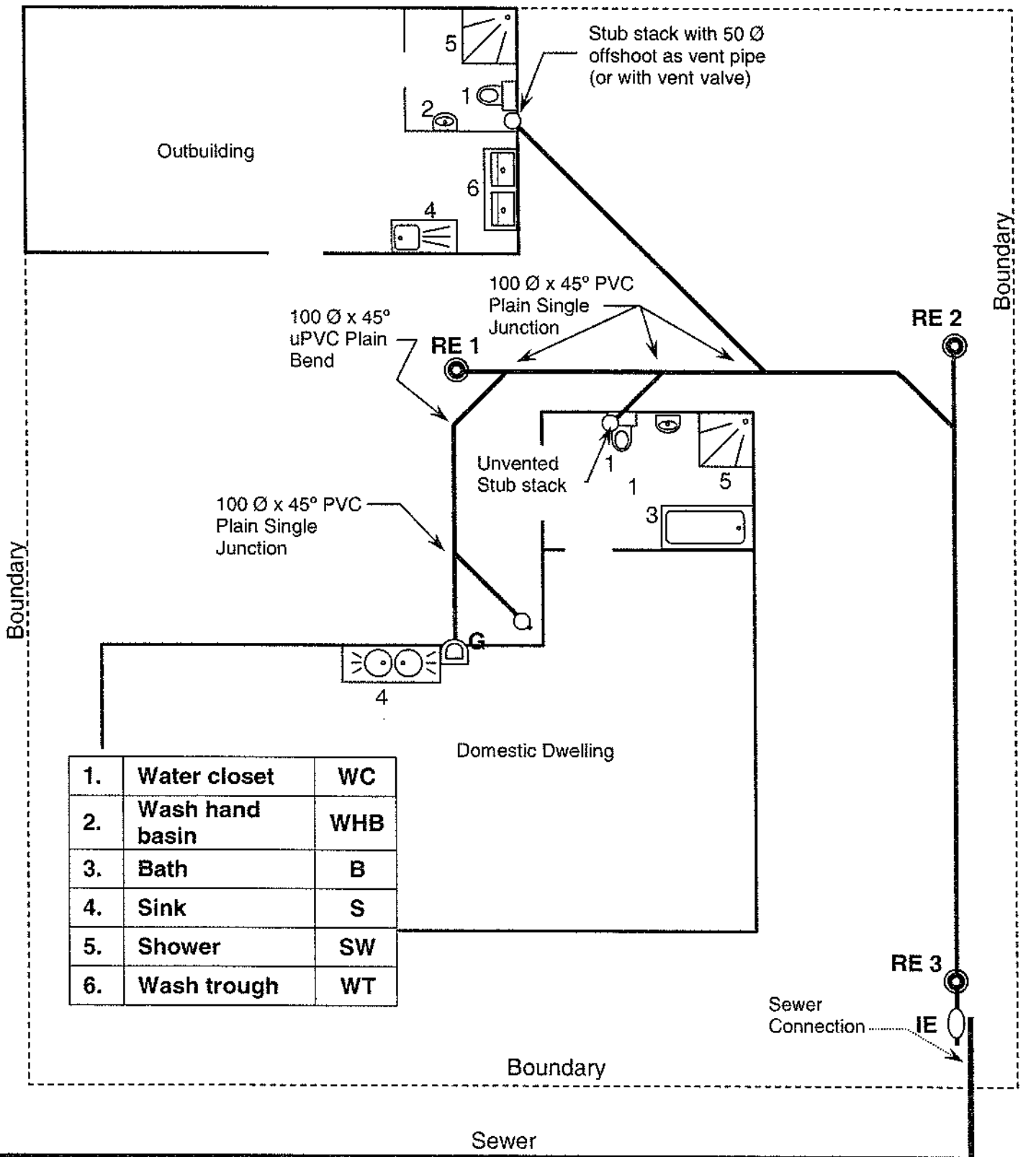
2.3	2.3.1	Stopcock√		
	2.3.2	Combination pressure control and relief valve√		
	2.3.3	Vacuum breaker√		
	2.3.4	Temperature and pressure safety valve√		
			(4 x 1)	(4)
2.4	2.4.1	Cold-water supply pipe√		
	2.4.2	Cold-water storage tank √		
	2.4.3	Fullway valve√		
	2.4.4	Cold-water feed pipe√		
	2.4.5	Calorifier√		
	2.4.6	Primary return pipe√		
	2.4.7	Boiler√		
	2.4.8	Drain-cock√		
	2.4.9	Primary flow pipe√		
	2.4.10	Expansion tank√		
	2.4.11	Expansion (vent/ steam) pipes√		
	2.4.12	Secondary flow pipe√		
	2.4.13	Tap-off points√		
	2.4.14	Secondary return pipes√		
			(Any 6 x 1)	(6) [20]

QUESTION 3: DRAINAGE

- 3.1 3.1.1
- An inspection chamber is a chamber not deeper than 1 m and of √
 - such dimensions that permanent access may be obtained to a drain√
 - without a person being required to enter such chamber. √
- (Any 2 x 1) (2)
- 3.1.2
- A conservancy tank (also known as a vacuum tank) receives both soil and waste from a common soil and wastewater drain. √
 - The sewage is stored temporarily in the conservancy tank and √
 - the content is emptied at regular intervals (or as frequently as required). √
- (3)
- 3.2 (i) At a point within 1, 5 m of the connection of any drain to the connecting sewer, common drain or any sewage disposal unit on site. An access eye shall be installed immediately downstream of such point. √
- (ii) Every 25 m on a straight run of drain. √
- (iii) At the head of all drains√.
- (iv) At the head of any branch drain longer than 6 m. √
- (v) Immediately before and after a drain runs under a building. √
- (vi) Change of direction that exceeds 45° if a long radius bend is not used. A maximum of two changes of 90° shall be permitted between two rodding eyes. √
- (vii) On a stub stack in a closed drainage system. √
- (Any 3 x 1) (3)

- 3.3
- The organic matter is ✓
 - Fermented and decomposed by the ✓
 - Action of anaerobic bacteria, micro-organisms, maggots, worms ✓
 - Settles to the bottom of the tank as sludge. ✓
 - Fats and grease that are not retained in the grease trap also collect in ✓ the scum layer and usually remain there. ✓ (6)
- 3.4
- A portion of the water must be able to evaporate through the soil. ✓
 - The gasses must be allowed to escape. ✓
 - Vegetation, especially lawns, must be allowed to absorb some of the water. ✓ (Any 2 x 1) (2)
- 3.5
- 3.5.1 The shortest, most practical route should be used without affecting the effectiveness of the drain. ✓
- 3.5.2 The number of branch drains must be limited and also be as short as possible. ✓
- 3.5.3 Drains should only be allowed to run under or through buildings where no other route is available or if considerable cost savings will be made. ✓
- 3.5.4 Avoid excessive excavations. Follow natural gradient of ground. If not possible, consider the installations of ramps. ✓
- 3.5.5 The underground drain should be at least 1 m from the foundations, especially if the drain runs parallel to the building. ✓
- All regulations regarding ventilation, access, gradients, and invert depths (cover depths), etc. should be considered and adhered to. (Any 4 x 1) (4)

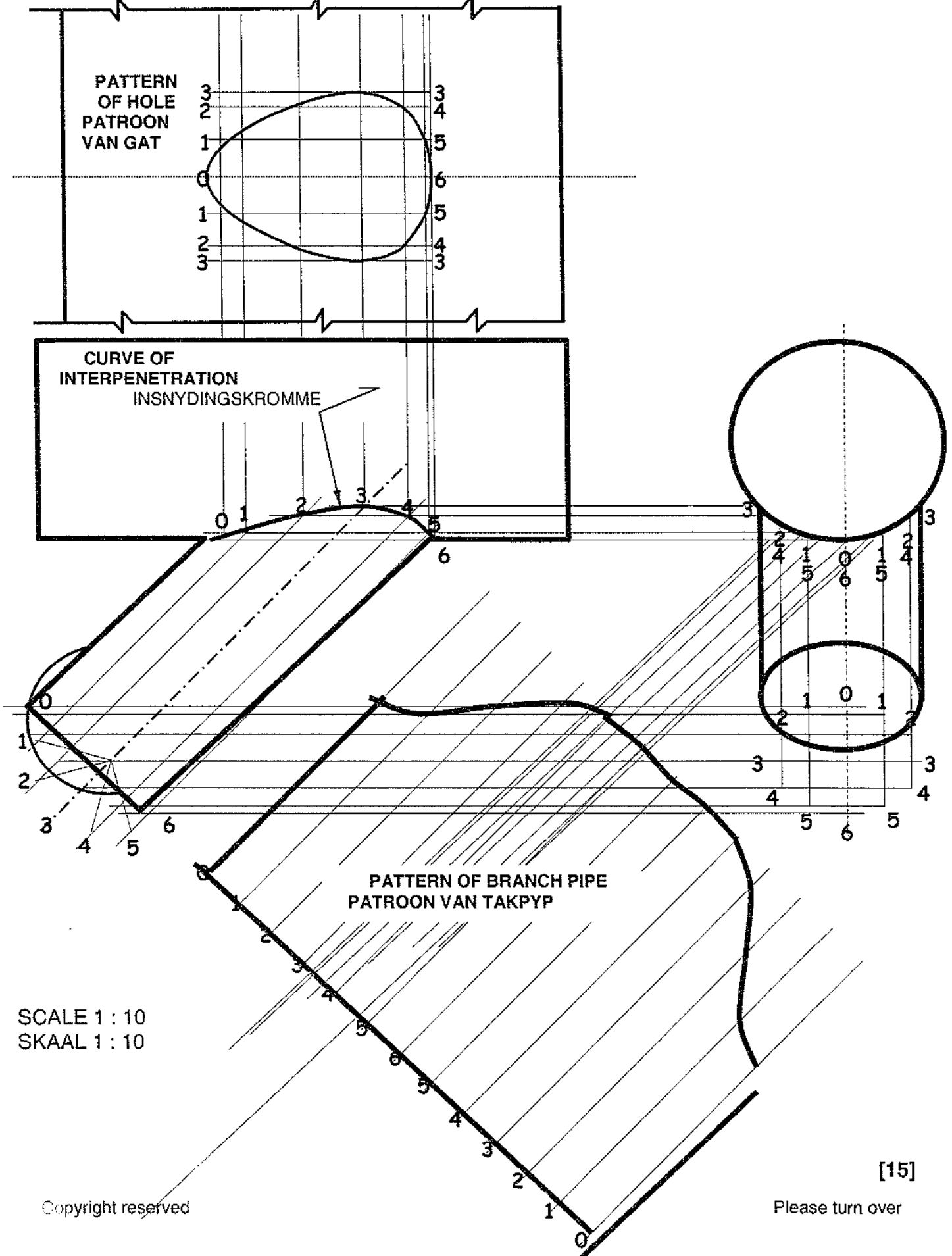
3.6



(15)
[35]

QUESTION 4: SHEET METAL WORK AND FLASHINGS

NOTE: Refer to Question Paper for mark allocation.



[15]

Please turn over

QUESTION 5: CALCULATIONS

5.1 Pressure at the tap:

Head of water (height) is 15 m + 800 mm = 15,8 m ✓

$$\begin{aligned}
 P &= D \times g \times h \\
 &= 1\,000 \text{ kg/m}^3 \times 9,81 \text{ m/s}^2 \times 15,8 \text{ m} \quad \checkmark\checkmark \\
 &= 154\,998 \text{ Pa} \div 1\,000 \quad \checkmark \\
 &= 154,998 \text{ kPa} \text{ or } 155 \text{ kPa} \quad \checkmark
 \end{aligned}$$

(5)

5.2 Pipe fittings required.

ITEM	DESCRIPTION	QUANTITY
1	Ø 22 mm MI x C straight adaptor, compression type (1 x outlet, 2 x gate valve) ✓✓✓	3
2	Ø 22 mm 90° elbow, compression type ✓	1
3	Ø 22 mm wall plate elbow, compression type ✓	1

(5)

[10]

TOTAL: 100