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.

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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)

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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'. √

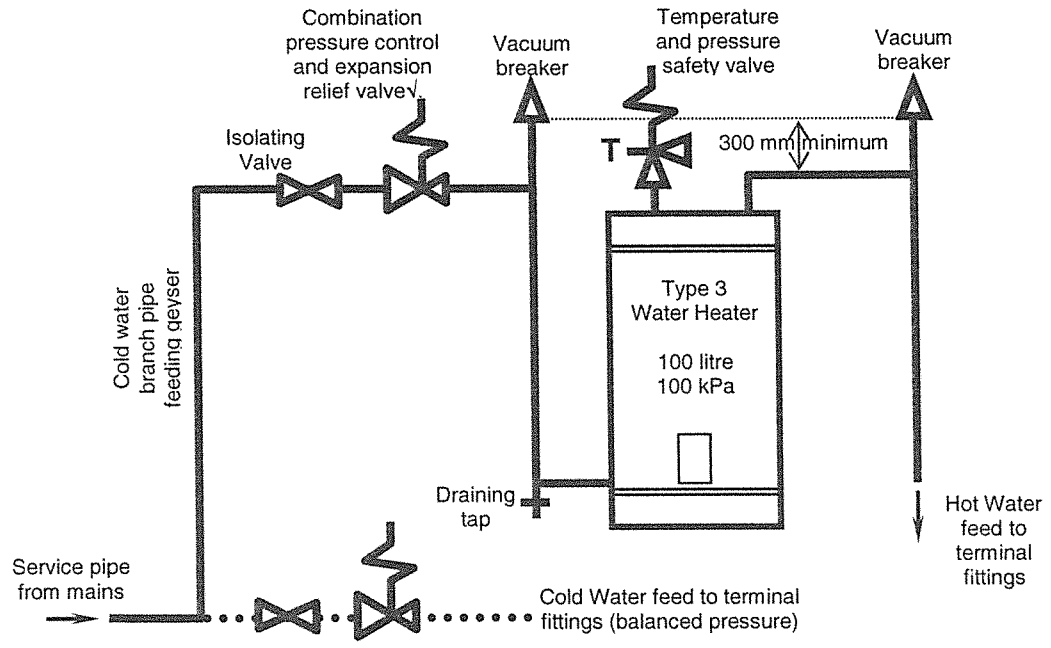
(Any 2 x 1) (2)

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)

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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. √

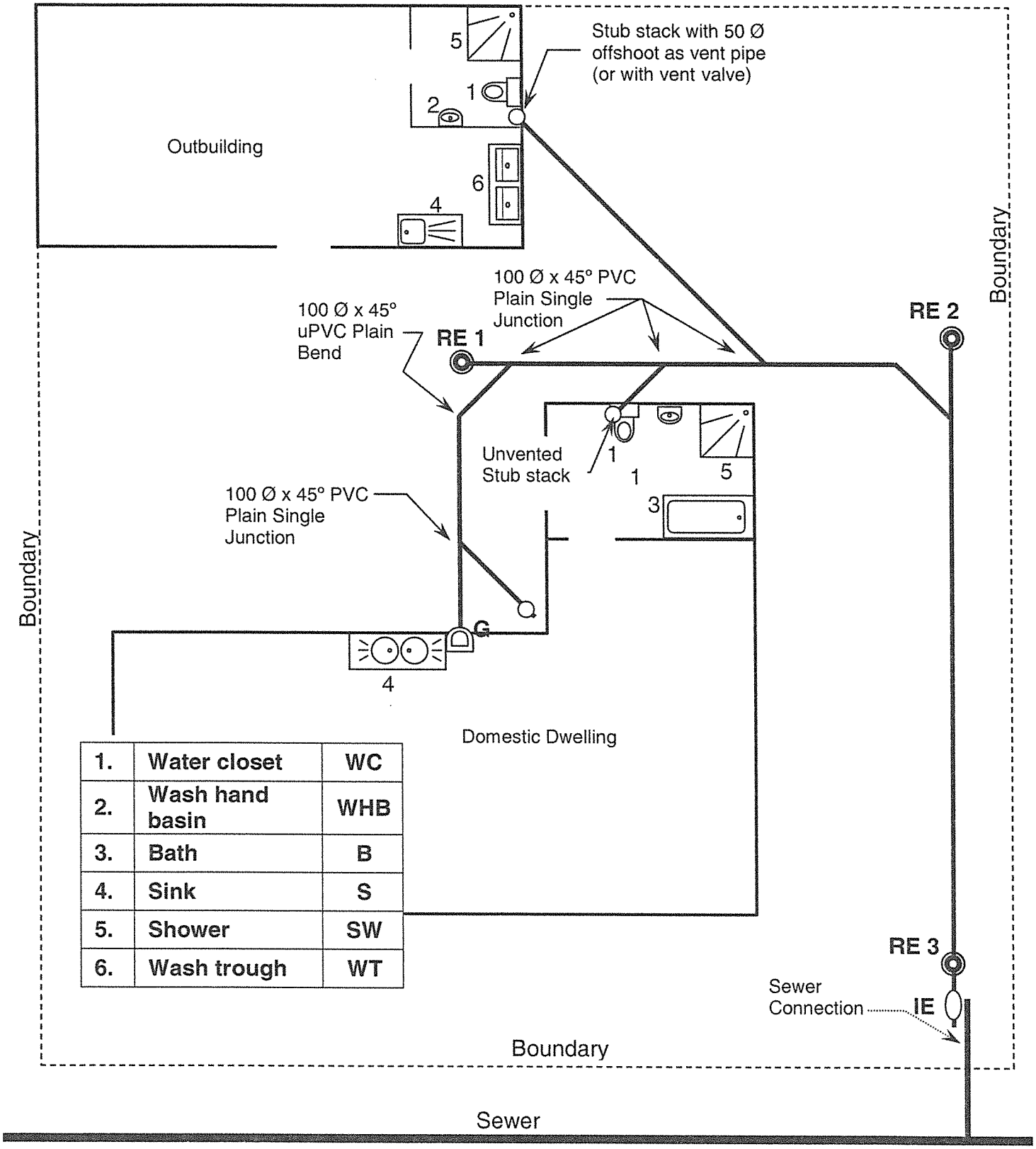
3.5.4 Avoid excessive excavations. Follow natural gradient of ground. If not possible, consider the installations of ramps. √

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)

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3.6



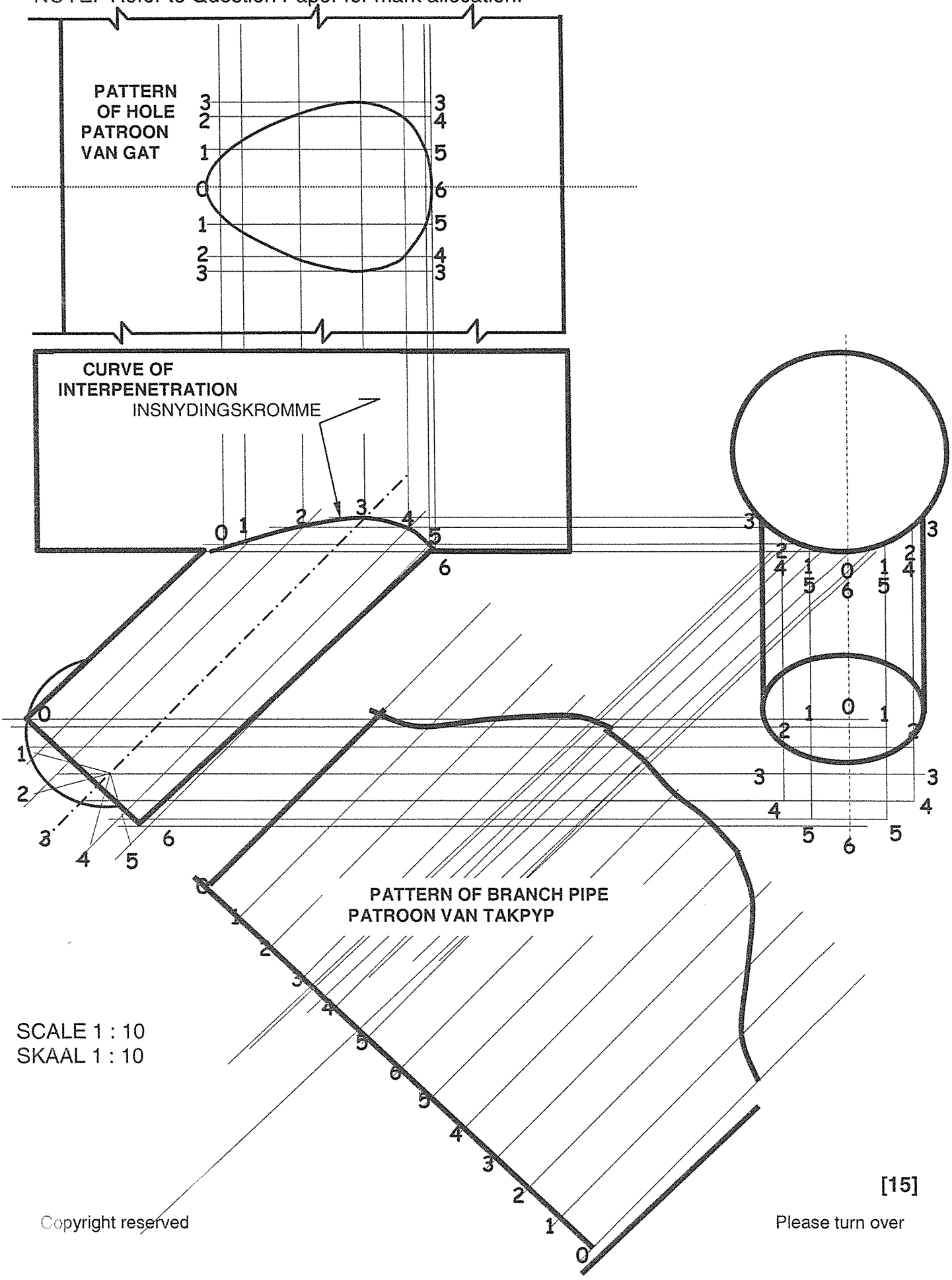
1.	Water closet	WC
2.	Wash hand basin	WHB
3.	Bath	B
4.	Sink	S
5.	Shower	SW
6.	Wash trough	WT

(15)
[35]

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QUESTION 4: SHEET METAL WORK AND FLASHINGS

NOTE: Refer to Question Paper for mark allocation.



[15]

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QUESTION 5: CALCULATIONS

5.1 Pressure at the tap:

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

P = D x g x h
= 1 000 kg/m³ x 9,81 m/s² x 15,8 m √√
= 154 998 Pa ÷ 1 000 √
= 154,998 kPa or 155 kPa √ (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

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