higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

AUGUST EXAMINATION

PLUMBING THEORY N2

22 JULY 2014

This marking guideline consists of 8 pages.

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QUESTION 1: COLD-WATER SUPPLY

1.1
- To allow the untreated water to √
- pass through layers of material √
- while treated chemically to √
- remove bacteria and microscopic suspended matter from the water √ (4)

1.2
- Provides water to the consumer. √
- Ensures an adequate reserve (usually a two- to three-day supply) of water in case of an interruption to the supply from the water treatment plant or control reservoirs. √
- Provides the necessary pressure head to the water mains. √
- Convenient place to regulate and control the water supply and quality thereof. √

(Any 2 x 1) (2)

1.3
- The hard water has calcium and magnesium ions that are positively charged, and the zeolite has sodium ions. √
- As the hard water filters through the zeolite, an exchange of ions takes place between the sodium and the calcium and/ or magnesium. √
- Soluble sodium carbonate, sodium sulphate and/or sodium chloride are formed. √
- These soluble salts have no adverse effects on the degree of hardness of the water. √
- It does, however, leave a brackish taste in the water. √
- The zeolite sodium base will eventually be completely changed to a calcium and/or magnesium base and will then not be able to soften the water. √
- The zeolite must then be regenerated. √ (7)

1.4
- Ordinary water should be safe to drink, √
- attractive in appearance (sparkling), √
- free from taste√
- and odour and√
- usable for a variety of household and√
- industrial purposes. √

(Any 3 x 1) (3)

1.5 1.5.1 Pressure: 300 kPa √
Flow Rate: 0,5 litres/sec √ (2)

1.5.2 Pressure: 300 kPa √
Flow Rate: 20 litres/sec √ (2)

[20]

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QUESTION 2: HOT-WATER SUPPLY

2.1
- If a negative pressure (25 kPa below atmospheric) is created in the hot-water system, √
- the atmospheric pressure on the outside of the seal (washer) will overcome the force in the spring holding the washer in position. √
- Air will enter the hot-water system and prevent the emptying of the geyser by syphonic action. √

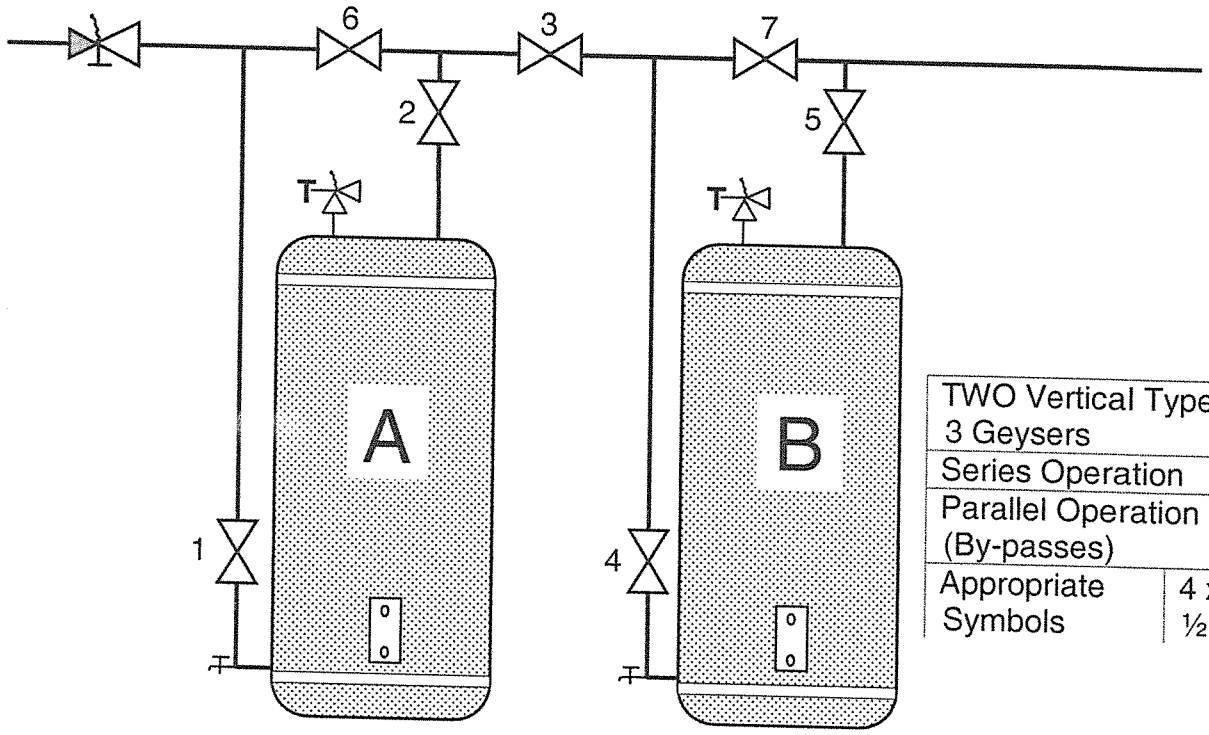
(3)

2.2
- The pressure control valve is separated into an inlet chamber and an outlet chamber by a washer held in position by a spindle and a pressure spring. √
- This separation (closed position) is maintained due to the pressure of the water on the outlet side. √
- When the hot-water outlets are open the pressure in the outlet chamber is reduced. √
- The force of the spring overcomes the force of the pressure in the outlet chamber and thus moves the valve off its seat to open the passage of water to the outlet chamber to the tap-off points. √
- When the tap-off point is closed, the build of pressure on the diaphragm compresses the pressure spring and the washer seats onto opening to the outlet chamber. √
- This again isolates the inlet chamber from the outlet chamber and the pressure control valve is in a closed position. √

(6)

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2.3 (8)



TWO Vertical Type 3 Geysers		**2**
Series Operation		**2**
Parallel Operation (By-passes)		**2**
Appropriate Symbols	4 x ½	**2**

OPERATING PRINCIPLES:
BOTH GEYSERS FUNCTIONAL:
Valves Open: 1, 2, 3, 4 and 5 Valves Closed: 6 and 7
ONLY GEYSER A FUNCTIONAL:
Valves Open: 1, 2, 3 and 7 Valves Closed: 4, 5 and 6
ONLY GEYSER B FUNCTIONAL:
Valves Open: 6, 3, 4 and 5 Valves Closed: 1, 2 and 7

2.4
- Not very cost-effective during periods of no direct sunshine√
- Costly installation√
- Unsightly on roofs√
- Added weight to be carried by roof structure.

(Any 3 x 1) (3)
[20]

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QUESTION 3: DRAINAGE

3.1 3.1.1

- An inspection eye is an access opening to the interior of any pipe or pipe fitting in a drainage installation provided solely √
- for the purpose of inspection and testing, and to which √
- permanent access after completion of the drainage installation need not be provided. √ (3)

3.1.2

- Because sewage contains materials such as rags, plastics, pieces of wood, not to mention occasional cans and bottles, these items must be removed first. √
- This is achieved by passing all incoming flows through a set of screens. These consist of a series of vertical bars set in the flow channel such that each bar is about 25 - 30 mm. √
- Anything that will not pass through such a gap will be arrested on the bars and periodically raked off or deposited on to a conveyer belt immediately. √
- This material is then compressed to squeeze out as much of the water as possible to reduce the volume before being discharged to a container for burial off the site. √
- Following screening flows pass through a grit removal machine called a detritus, that is a shallow tank designed to slow the velocity of the flow down to precisely 0,3 m/s.
- At this speed any gritty material settles on the floor of the tank from which it is constantly removed by a scraper mechanism, while the lighter organic material is kept in suspension.
- If rags, grit, etc. are not removed from the flow at the beginning of the treatment works, this will cause blockages in the pipe work and severe abrasion in the pumps and other equipment used in the subsequent stages. (Any 4 x 1) (4)

3.1.3

- Stub stack refers to a common soil and waste stack √
- not more than one storey high √
- with a rodding eye of 100 mm at the top. √ (3)

3.2

- Drainage work and sanitation in general are closely linked to public hygiene and the health of humans. √
- Because a great deal of the drainage system is underground, any defect or leakage will not be detected immediately and foundations could be damaged. √
- The quality of materials and workmanship must ensure years of carefree and effective service. √ (3)

3.3

Fall = Distance × Gradient

√√ $= 9{,}5 \times \frac{1}{40}$

$= 0{,}2375$ mm

Invert Depth = Invert Depth$_{HEAD}$ + Fall

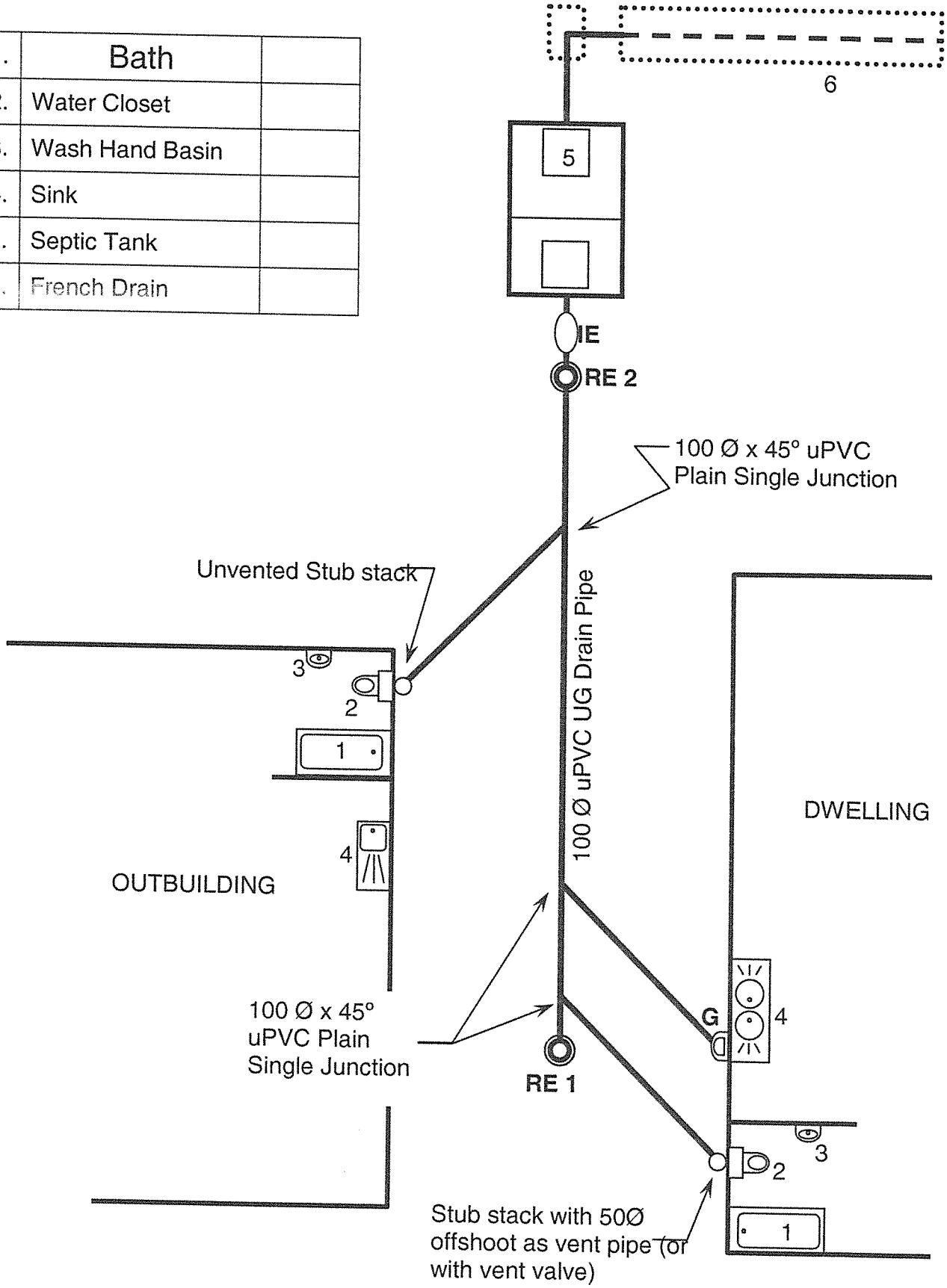
√√ = 400 + 237,5

= 637,5 mm (4)

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3.4

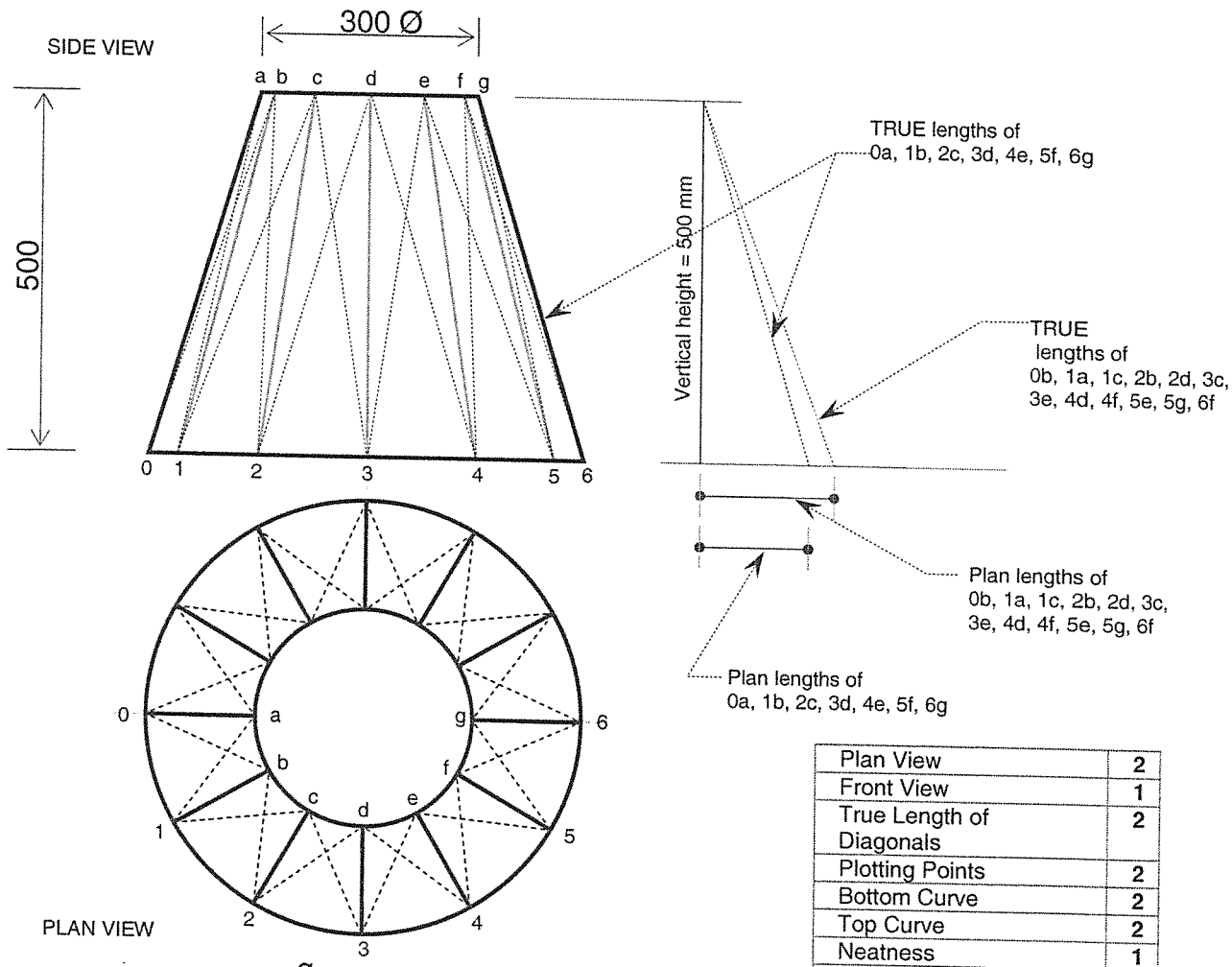
1.	Bath	
2.	Water Closet	
3.	Wash Hand Basin	
4.	Sink	
5.	Septic Tank	
6.	French Drain	



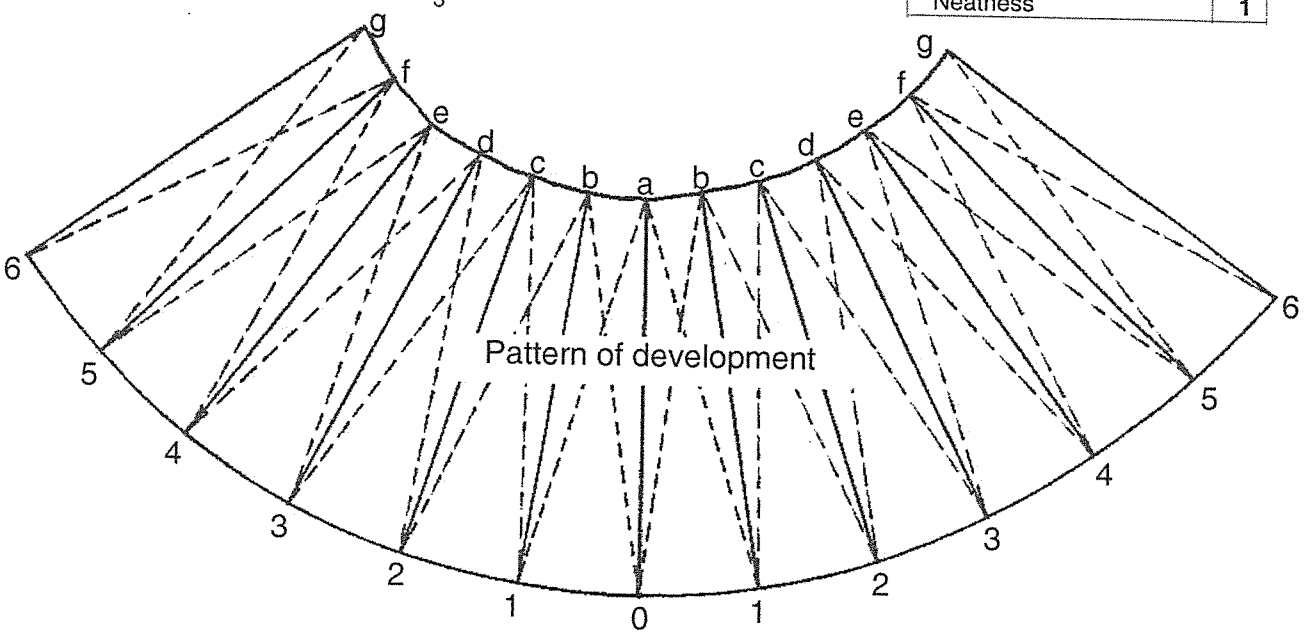
(18)
[35]

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QUESTION 4: SHEET METAL WORK AND FLASHING



Plan View	2
Front View	1
True Length of Diagonals	2
Plotting Points	2
Bottom Curve	2
Top Curve	2
Neatness	1



[15]

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QUESTION 5: CALCULATIONS

No	Description	Quantity	Unit Price	Amount
1	110 Ø uPVC Pipe	8 m		
2	50 Ø uPVC Pipe	1,5 m		
3	40 Ø uPVC Pipe	5 m		
4	110 mm Pan Connector with Rubber Seal	2		
5	110 mm x 95° IE Bends	2		
6	110 mm x 95° Single Junctions	2		
7	Basin Trap (40 mm x 1¼")	2		
8	Basin Waste Outlet Fitting (Chromium Plated) (1¼")	2		
9	Bath Trap (With Integral Overflow) (40 mm x 1½")	2		
10	Bath Waste Outlet Fitting With Overflow Fitting (1½")	2		
11	Double Bowl Sink Waste Assembly (40 mm x 1½")	1		
12	Double Bowl Sink Waste Outlets Fitting (1½") Complete with Overflow Fitting and Flexible Overflow Pipe	1		
13	Sink Trap (40 mm x 1½")	1		
14	40 mm x 95° IE Bends	5		
15	40 mm x 135° IE Bends	1		
16	50 mm x 95° Plain Single Junctions	2		
17	50 mm x 40 mm Solvent Weld Reducer	4		
18	100 mm x 50 mm x 95° Plain Single Junction	2		
19	110 mm Vent Cowl	1		
20	110 Ø Pipe Clips	8		
21	50 Ø Pipe Clips	4		
22	40 Ø Pipe Clips	10		
23	500 ml Solvent Weld Cement / Glue	1		
24	500 ml Lubricant	1		

[10]

TOTAL: 100

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