higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

NOVEMBER EXAMINATION

PLUMBING THEORY N2

12 NOVEMBER 2014

This marking guideline consists of 8 pages.

QUESTION 1: COLD-WATER SUPPLY

1.1 Chlorine√
- Calcium hypochlorite (bleach powder) √
- Chlorine dioxide√
- Ozone√
- Sodium hypochlorite√
- Ammonia (with chlorine) √

(Any 1x1) (1)

1.2 1.2.1 Copper is relatively safe because minute amounts of dissolved copper is not poisonous √and soft water usually leaves a green tinge on the tubing which is quite harmless. √

1.2.2 The corrosion of metals (galvanised iron) is accelerated if the water passes through organic soils (peaty areas) √ and it can be neutralised by the addition of limestone or chalk. √

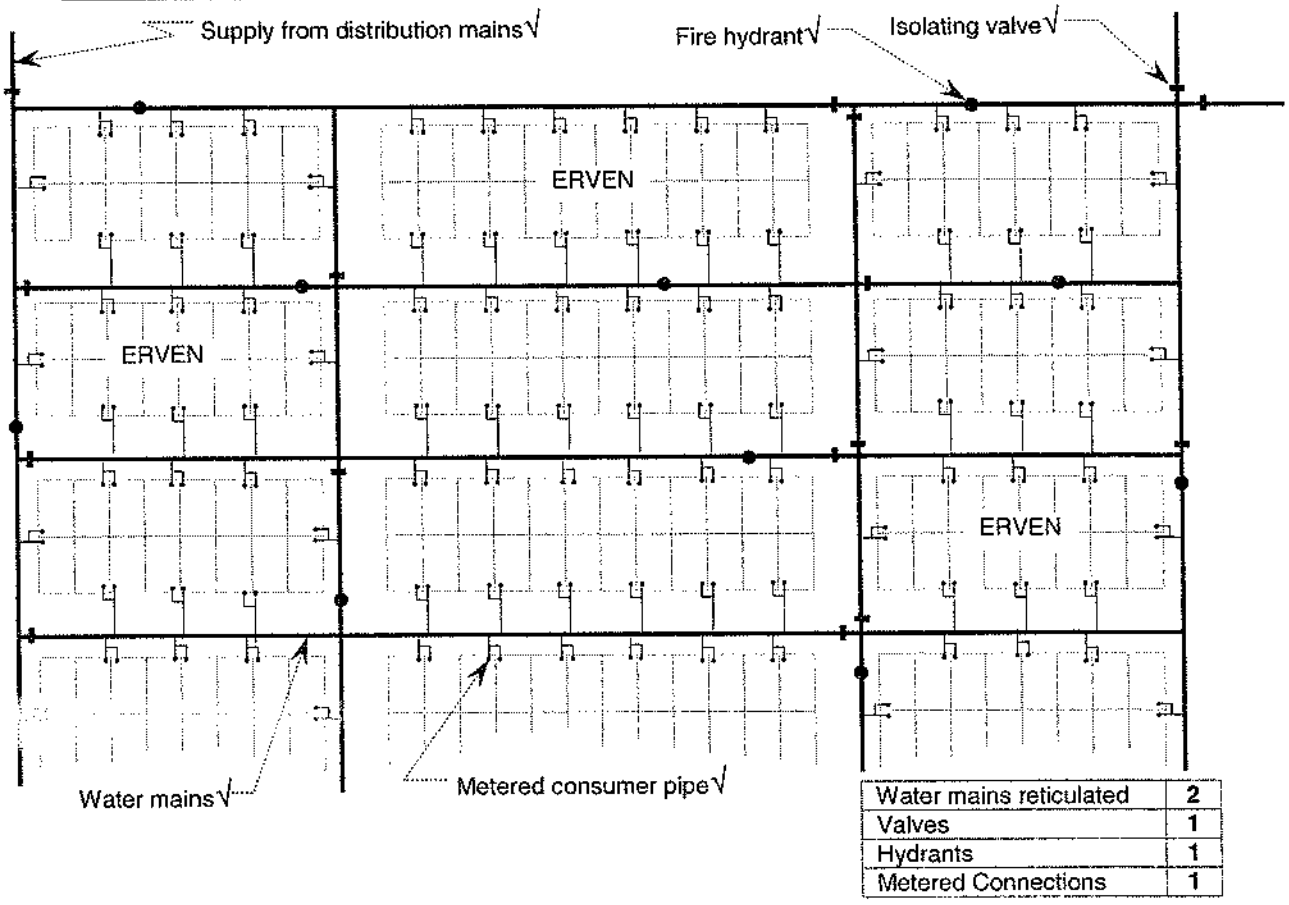
(2 × 2) (4)

1.3

VIBRATIONS IN PIPEWORK	WATER HAMMER
• Excessive water velocity. √ • Loose washer plate assembly in stopcocks. √ • Faulty washer in tap, stopcock or mixer. √ • Inlet pipe undersized. √ Any x2	• Undersized piping. √ • Incorrect valve installation. √ • Loose piping. √ • Air is trapped in pipes. √ Any x2

(4)

1.4



Water mains reticulated	2
Valves	1
Hydrants	1
Metered Connections	1

(5)

1.5 Yes. √ The carbonic gases can be driven off by boiling. √ (2)

1.6 To ensure a safe preset temperature of the water at the terminal fitting√ (1)

1.7
- Service reservoirs are not always situated on the same elevation (height). This means that a reservoir, which is situated on a higher level, will automatically lose its water to a reservoir on a lower level if their reticulation networks are interconnected. √
- It then also stands to reason that these reticulation networks will be operating under different water pressures (static). Reticulation networks from a specific reservoir will be isolated from networks that are supplied with water from another reservoir. These clusters of networks are termed pressure zones. √
- These interconnections must be supplied with an isolating valve that will be closed under normal circumstances. These valves are called zone valves and isolate pressure zones. √ (3)

[20]

QUESTION 2: HOT-WATER SUPPLY

2.1 2.1.1 ACTIVATED BY EXCESSIVE TEMPERATURE (+95 °C) [SABS 198:1992 (5,4)]

- When the water temperature reaches 93-98 °C, the very stable wax in the probe expands rapidly. √
- The plug above the wax then exerts an upward force against the piston. √
- The force overcomes the force in the spring and the piston with washer is lifted off the seat of the outlet. √
- The water passage is then opened and the very hot water is moved out. √
- The water in the system is cooled by the incoming cold water. √
- When the water reaches a temperature of not lower than 75 °C the wax contracts and the temperature-pressure (TP) safety valve closes. √

(NOTE: An increase in temperature also leads to an increase in the pressure of the water in the system.) (5)

2.1.2 (1, 5 TIMES IT'S NOMINAL PRESSURE RATING) SABS 198: 1992

- The outlet of the TP-safety valve is closed off by a washer that is spring-loaded. √
- When the force of the water (due to the pressure) overcomes the force in the spring, √
- the washer is lifted off its seat and √
- the water passage is opened. √
- The water will then escape to the outside thus decreasing the pressure in the system. √ (5)

2.2

ADVANTAGES	DISADVANTAGES
• Solar (sun) energy is used to heat the water, marked decrease in the electricity consumption; cheaper • A decrease in electricity consumption is more environmentally friendly (Any 1 x 1) √	• Not very effective in periods of no direct sunlight – (cloudy periods) • Costly installation • Unsightly on roofs • Added weight to roof structure (Any 1 x 1) √

(2)

2.3 Both the hot- and the cold-water pressure are controlled by either the same:
- water supply tank or√
- pressure control valve√

(2)

2.4
- Prevents the collapse of copper hot-water cylinders√√
- Facilitates draining of the geyser when required√√
- Prevents back syphonage on hot-water lines √ √ (Any 2 x 2) (4)

2.5 2.5.1 Red√

2.5.2 Green√

(2 × 1) (2)

[20]

QUESTION 3: DRAINAGE

3.1 Any conservancy tank shall be so placed and so designed that:
- It must not become a source of nuisance or danger to health is not likely √
- to endanger the structure of any building or√
- any services on the site. √

(Any 2x1) (2)

3.2 3.2.1 When they are laid underground horizontally next to each other, they shall be laid at least 500 mm apart, and√

3.2.2 When they cross each other, the line of the drain shall be laid at least 100 mm below that of the pipe conveying such potable water√

(2 × 1) (2)

3.3 The one-pipe system means a:

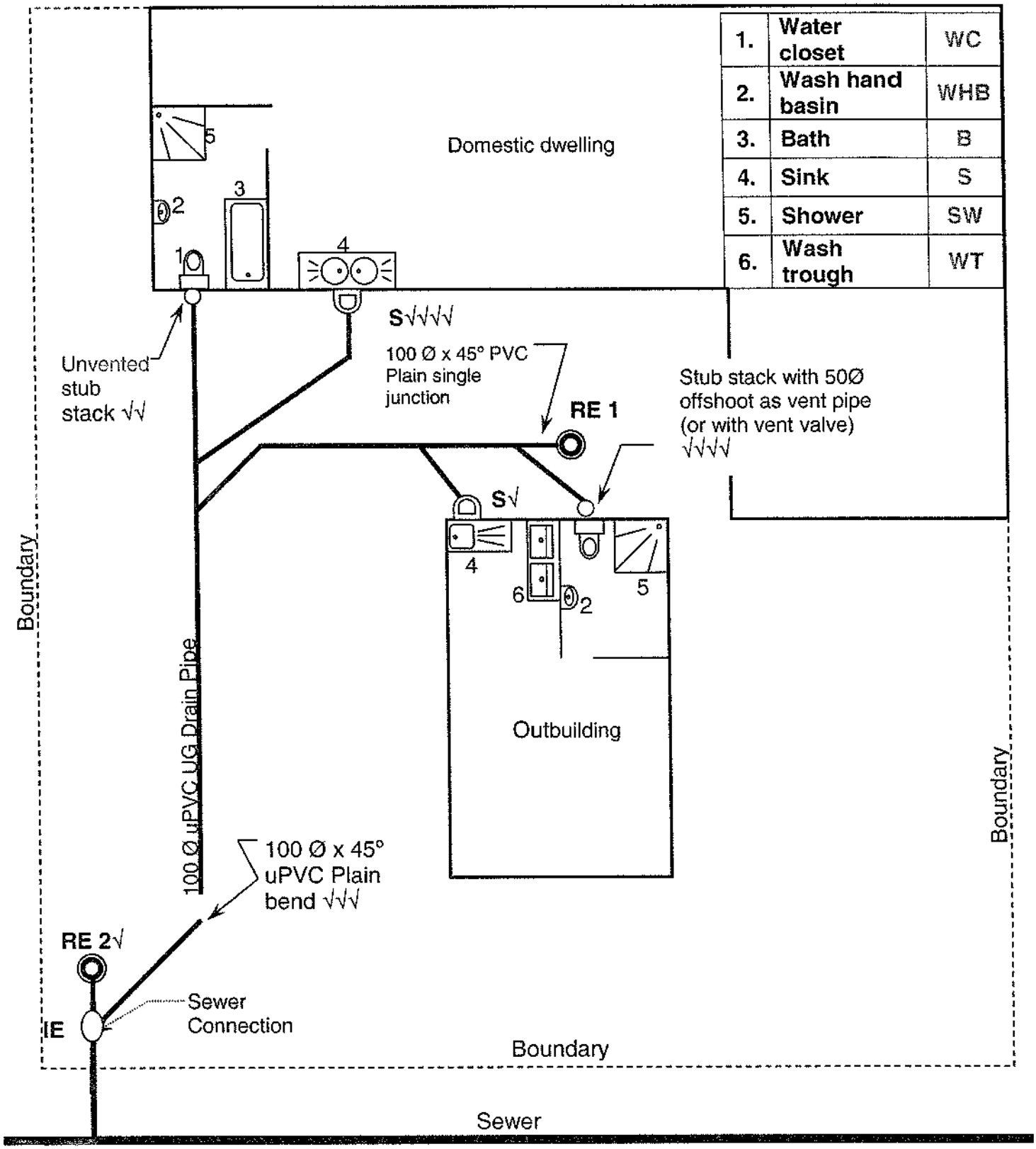
- system of piping between sanitary fixtures and the underground drain in which √
- both soil water and waste water √
- discharges down a common stack and in which√
- any trap venting or other venting required may be via a common vent stack. √

(4)

3.4
- 1,7 m^3√√
- The expected daily flow. (whichever is greatest) √√

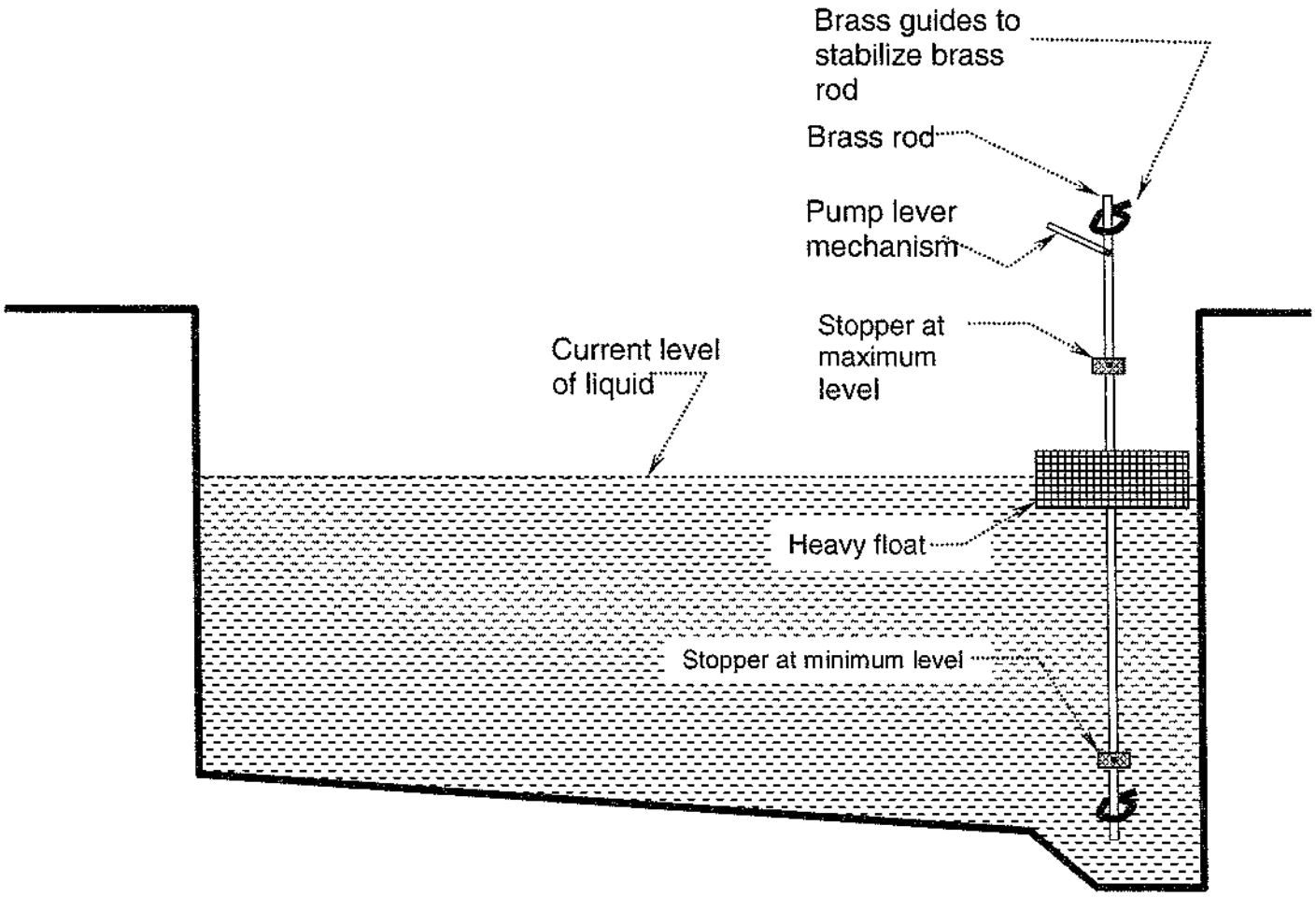
(4)

3.5


1. Water closet WC
2. Wash hand basin WHB
3. Bath B
4. Sink S
5. Shower SW
6. Wash trough WT
Domestic dwelling
S√√√√
100 Ø x 45° PVC Plain single junction
RE 1
Stub stack with 50Ø offshoot as vent pipe (or with vent valve) √√√√
Unvented stub stack √√
S√
Outbuilding
Boundary
100 Ø uPVC UG Drain Pipe
100 Ø x 45° uPVC Plain bend √√
RE 2√
IE
Sewer Connection
Boundary
Boundary
Sewer

(15)

3.6√√√√



DIAGRAMMATIC LAYOUT OF SUMP PUMP CONTROL MECHANISM

(3 marks for a suitable sketch + 2 x ½ for suitable lables) (4)

Operation of switch:

1. The float rises with the water (sewage) until it is against the adjustable stopper at maximum level. √

2. It eventually exerts enough pressure against the stopper and lifts the brass rod which then switches the motor and pump on. √

3. The liquid is then pumped out of the accumulating sump; the level of the liquid (and thus also the float) drops. √

4. The float drops onto the adjustable stopper at the minimum level. √

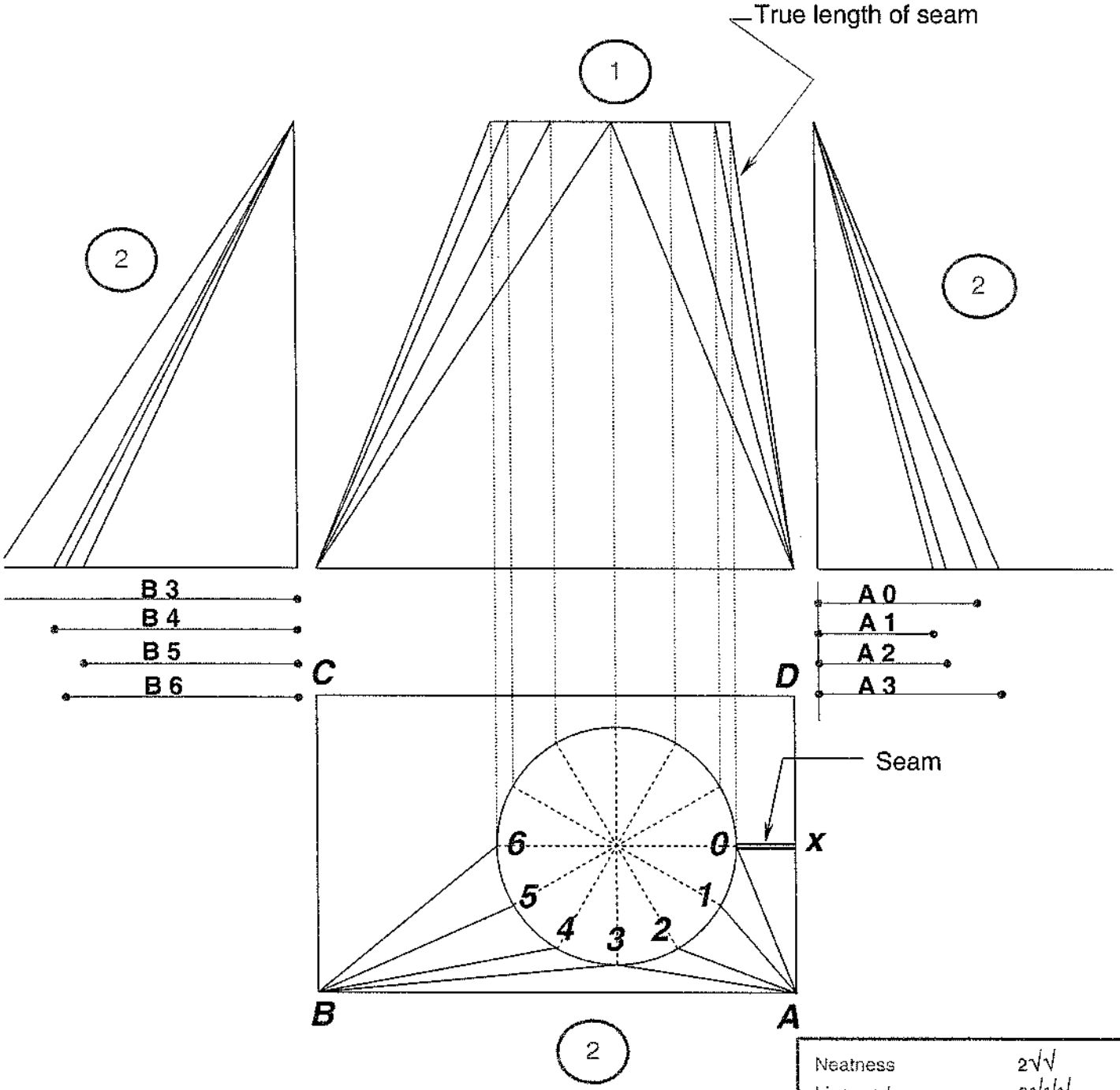
5. The weight of the float and the rod pulls the switch down. The motor is then switched off. √

6. The level of the liquid rises and the process is repeated. √

(4 marks for a suitable description) (4)

[35]

QUESTION 4: SHEET-METAL WORK AND FLASHING



Neatness	2√√
Line work	3√√√
Base Lines	5√√√√√
Segments of circle	3√√√
Smooth arc	2√√

NOTE: Because the transition piece is symmetrical about the horizontal axis, only the true lengths of the top half OR the bottom halve need to be determined.

[15]

QUESTION 5: CALCULATIONS

5.1 $Volume\ of\ water = Length \times Width \times Height$

$= 1\,200\ mm \times 1\,600\ mm \times 1\,500\ mm$

$= 1{,}2\ m \times 1{,}6\ m \times 1{,}5\ m$

$= 2{,}88\ m^3$ (3)

5.2 $Total\ Mass = Mass\ of\ water + Mass\ of\ \tan k$

$= Density \times Volume + 210\ kg$

$= 1\,000 \times 2{,}88 + 210$

$= 2880 + 210$

$= 3\,090\ kg$ (4)

5.3 $Area\ of\ material = 2\,[Short\ Sides] + 2\,[Long\ Sides] + [Base]$

$= 2\,[1{,}2 \times 1{,}5] + 2\,[1{,}6 \times 1{,}5] + [1{,}2 \times 1{,}6]$

$= 3{,}6 + 4{,}8 + 1{,}92$

$= 10{,}32\,m^2$ (3)
[10]

TOTAL: 100