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# **basic education**

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Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

## **SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS**

**CIVIL TECHNOLOGY: CIVIL SERVICES**

**2021**

**MARKING GUIDELINES**

**MARKS: 200**

**These marking guidelines consist of 16 pages.**

**INSTRUCTIONS FOR THE MARKERS****1. Markers should:**

- Familiarise themselves with the question and answer before evaluating the responses of candidates.
- Always interpret the responses of the candidates within the context of the question.
- Consider any relevant and acceptable answer during pre-marking but should strictly adhere to the answers after finalisation of the marking guideline.
- There are two approaches to answering questions, these are (1) to describe and (2) to explain.

If a candidate is required to explain e.g., a process in 4 steps, only the first 4 responses should be considered.

If, however a candidate is required to e.g., explain or describe how to transfer heights from one point to another using a transparent pipe level we need to consider that candidates may write a long description not necessarily well organised as an intellectual response may do. In this case the marker needs to evaluate the complete statement to judge if the candidate explained the required outcome satisfactorily and allocate marks on merit. The marker should apply his/her professional judgement with these types of questions.

- Mark what the candidate wrote and do not award marks for answers that the marker thinks the candidate meant with what was written.
- Indicate the tick or cross right at the position where the mark needs to be awarded or where the candidate made the error.
- Accept the letter corresponding with the correct answer as well as the answer written in full in multiple-choice questions.
- Accept incorrect spelling in one-word answers unless the spelling changes the meaning of the answer.

**2. For calculations:**

- A mark is only awarded if the correct unit is written next to the answer.
- If TWO marks are awarded ONE mark is awarded for the answer and ONE mark for the correct unit.
- Where the candidate made a principle error e.g. added instead of multiplying, no marks will be awarded for the steps. If the answer is correct according to what the candidate did, the mark for the answer can be awarded for the application of skills.

- Where an incorrect answer could be carried over to the next step, the first answer will be deemed incorrect. However, should the incorrect answer be carried over correctly, the marker has to recalculate the values, using the incorrect answer from the first calculation. If correctly used, the candidate should receive the full marks for subsequent calculations.
- Markers should consider when and where a candidate has rounded off in a calculation, as well as the subsequent effect it has on the final answer obtained. The calculation should therefore be awarded marks on merit.
- Alternative methods of calculations must be considered, provided that the correct answer is obtained.

### **3. When marking drawings:**

- The member for which the mark should be awarded should be drawn correctly in the correct position to receive a mark.
- A member incorrectly drawn but wrongfully repeated in another position will be awarded the mark for the repeated incorrect member provided that the marking guideline provide for TWO or more marks for that member (positive marking).
- Marks can only be awarded for a label if the label is correctly indicating the correct member.
- Scale drawings should always be marked using an appropriate mask.

#### **When a candidate drew the wrong drawing e.g.:**


- A horizontal section instead of a vertical section, no marks will be allocated to the drawing as the candidate did not respond to the expected outcome.
- An orthographic view instead of sectional view, no marks will be allocated to the drawing as the candidate did not respond to the expected outcome.
- An orthographic view instead of an isometric view, no marks will be allocated to the drawing as the candidate did not respond to the expected outcome.
- If the incorrect drawing was drawn, the candidate can be awarded for only what was asked but mark/s for the correctness of the drawing will not be awarded e.g., if a King Post roof truss was asked in the question, and candidate drew SA-Howe Truss.

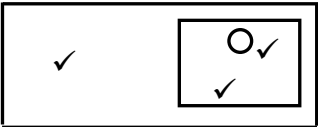
**QUESTION 1: OHSA, SAFETY, MATERIALS, TOOLS AND EQUIPMENT AND JOINING (GENERIC)**

- |     |       |   |            |
|-----|-------|---|------------|
| 1.1 | 1.1.1 | Paint ✓   | (1)        |
|     | 1.1.2 | Curing ✓  | (1)        |
|     | 1.1.3 | Electroplating ✓  | (1)        |
|     | 1.1.4 | Powder coating ✓  | (1)        |
|     | 1.1.5 | Galvanising ✓   | (1)        |
| 1.2 | 1.2.1 | <ul style="list-style-type: none"> <li>• Wood ✓</li> <li>• Aluminium ✓</li> <li>• Fibreglass</li> <li>• Steel</li> </ul>  | (2)        |
|     | 1.2.2 | <b>A</b> ✓ <ul style="list-style-type: none"> <li>• The ladder in <b>B</b> is broken/has defects. ✓</li> <li>• The rungs of the ladder in <b>B</b> are broken.</li> <li>• The stiles of the ladder in <b>B</b> are not properly joined.</li> <li>• The ladder in <b>A</b> has no defects/is not broken.</li> </ul>                    | (2)        |
|     | 1.2.3 | <ul style="list-style-type: none"> <li>• A ladder can be used to safely climb to a higher level. ✓</li> <li>• To access a higher level than a normal person can reach from the ground.</li> <li>• It can be used to safely descend from heights.</li> <li>• To enter or exit deep excavations.</li> </ul> <b>ANY ONE OF THE ABOVE</b> | (1)        |
|     | 1.2.4 | <ul style="list-style-type: none"> <li>• <math>\frac{1}{4}</math> (One quarter) of the upright(vertical) length of the ladder ✓</li> <li>• 1 : 4 ratio</li> <li>• 75°/76°</li> </ul> <b>ANY ONE OF THE ABOVE</b>  | (1)        |
| 1.3 | 1.3.1 | To determine:<br>(a) The gradient/slope for sewerage system ✓<br>(b) A level line/reference point from where to start tiling ✓  | (1)<br>(1) |
|     | 1.3.2 | If the base of the tripod is not set up wide enough: <ul style="list-style-type: none"> <li>• the laser level can be blown or knocked over. ✓</li> <li>• the instrument can be damaged or its accuracy impaired if it should fall over.</li> <li>• the tri-pod will be unstable.</li> </ul> <b>ANY ONE OF THE ABOVE</b>               | (1)        |

- 1.4
- The worker can injure himself e.g. shoulder injury. ✓
  - Can injure fellow workers e.g. load can fall.
- ANY ONE OF THE ABOVE** (1)
- 1.5
- 1.5.1
- Before it is used ✓
  - Once a week
  - After bad weather
- ANY ONE OF THE ABOVE** (1)
- 1.5.2
- Qualified person ✓
  - Experienced person in the erection and maintenance of scaffolds
- ANY ONE OF THE ABOVE** (1)
- 1.6
- 1.6.1
- Bolt ✓ (1)
- 1.6.2
- Nut/Washer and nut ✓ (1)
- 1.6.3
- Bolts and nuts secure a stronger joint. ✓
  - Use of bolts and nuts/bolts, washers and nuts will ensure that parts are secured tightly together, which is not always possible with screws.
  - Can easily be removed.
- ANY ONE OF THE ABOVE** (1)
- [20]**

**QUESTION 2: GRAPHICS AS MEANS OF COMMUNICATION (GENERIC)**

NO.	QUESTION	ANSWER	MARKS
1.	Identify the type of plan in FIGURE 2.	Site plan ✓	1
2.	Deduce from the notes the brick force installation up to window height.	Every third course ✓	1
3.	Deduce the scale that is used for FIGURE 2.	1 : 200 ✓	1
4.	Identify number 1.	Boundary line ✓	1
5.	Identify number 3.	Building line ✓	1
6.	Identify number 5.	Main sewer line/Sewer line ✓	1
7.	Identify number 7.	Entrance/Driveway ✓	1
8.	Identify number 8.	Municipal sewer connection/Municipal Manhole/Manhole ✓	1
9.	Identify number 9.	North/North symbol/direction/point ✓	1
10.	Name the item in the column for the notes in FIGURE 2 that must be installed in the bathroom.	Shower ✓	1
11.	Draw the electrical symbol as described in the column for the notes in FIGURE 2	 ✓ ✓	2
12.	Deduce from FIGURE 2 which company printed the building plan.	Henson Printers ✓	1
13.	Give the abbreviation for number 2.	RE ✓	1
14.	State the colour that you would use to indicate the new dwelling on the site plan.	Red ✓	1
15.	Deduce from FIGURE 2 why the new dwelling is to be built on a corner plot.	<ul style="list-style-type: none"> <li>• No plot on eastern side ✓</li> <li>• Quarter rounding at the corner of the pavement</li> <li>• Paving on the eastern side</li> <li>• Street on the eastern side</li> </ul> <b>ANY ONE OF THE ABOVE</b>	1
16.	Deduce the plot number of the new dwelling illustrated in FIGURE 2.	51 ✓	1
17.	Which elevation is the closest to Protea Street?	South elevation ✓	1

18.	What is the plot number of the property on the western side of the dwelling?	49 ✓	1
19.	Give the abbreviation for number 6.	MH ✓	1
20.	State the slope at which the main sewer line should be installed.	1:40 ✓	1
21.	Describe what was done as revision 1.	Rectify dimension ✓	1
22.	Deduce the dimension fault on the total width of the dwelling.	100/14 100/14 000 mm ✓	1
23.	State the project number for this plan.	GR 448 - 209 ✓	1
24.	What is the width of the pavement?	1 500 mm or 1,5 m ✓	1
25.	How many branch pipes are indicated on the plan?	5 ✓	1
26.	Explain the purpose of number 4.	To give access to the sewer line when blockages occur/or for inspection purposes. ✓	1
27.	In what SI unit are the dimensions indicated on the plan?	mm ✓	1
28.	Draw a neat freehand drawing of the top view of the symbol of a single kitchen sink, as indicated in the <i>SANS/SABS Code of Practice for Building Drawings</i> .		3
29.	Recommend TWO types of building materials that can be used to finish the area at number 7.	Bricks/Paving ✓ Tar ✓ Concrete slab/Gravel/Asphalt <b>ANY TWO OF THE ABOVE</b>	2
30.	Calculate the total area of the plot. Give your answer in m <sup>2</sup> . Show ALL calculations.	(35 m ✓ x 25 m ✓) = 875 m <sup>2</sup> ✓ <b>OR</b> (35 000 mm x 25 000 mm) = 875 m <sup>2</sup>	3
31.	Calculate the distance between Number 1 and Number 3 on the north elevation. Show ALL calculations.	(10 000 mm ✓ - 3 000 mm ✓) = 7 000 ✓ mm ✓ <b>OR</b> (10 m - 3 m) = 7 m	4
		<b>TOTAL:</b>	<b>40</b>



**QUESTION 3: CONSTRUCTION ASSOCIATED WITH CIVIL SERVICES, OHSA AND QUANTITIES (SPECIFIC)**

- 3.1      3.1.1      Ground level before excavation/NGL ✓ (1)
- 3.1.2      • Concrete slab ✓  
• Floor slab (1)
- 3.1.3      Factors that can cause ground movement can include:  
• Blasting ✓  
• Piling ✓  
• Compaction  
• Any construction that involves vibrations (2)
- 3.1.4      1:2✓✓ **OR**  $1 \geq 2$  (2)
- 3.2      Warning signals:  
• Red ✓  
• Orange ✓ (2)
- 3.3      Items that should not be placed near the edge of an excavation are:  
• Any type of load ✓  
• Materials ✓  
• Heavy machinery/vehicles  
• Equipment  
**ANY TWO OF THE ABOVE** (2)
- 3.4      Soil compaction is a process of increasing the density of soil ✓ by pressing the soil particles closer together. ✓  
**OR**  
Reducing the volume of air trapped between the particles using hand compaction or a rammer. (2)
- 3.5      Sandy soil ✓ (1)
- 3.6      3.6.1      Shoring ✓ (1)
- 3.6.2      • To support the sides of the excavations. ✓  
• To ensure that sides do not cave in.  
**ANY ONE OF THE ABOVE** (1)

3.7 Volume of tank:

$$= \text{Area of base} \times \text{height}$$

$$= \pi r^2 h \checkmark$$

$$= \pi (3,14) \checkmark \times 0,8 \checkmark \times 0,8 \checkmark \times 3,1 \checkmark$$

$$= 6,23 \text{ m}^3 \checkmark$$

**OR**

$$= \pi (3,14) \times 800 \times 800 \times 3\,100$$

$$= 6,23 \text{ m}^3$$

(6)

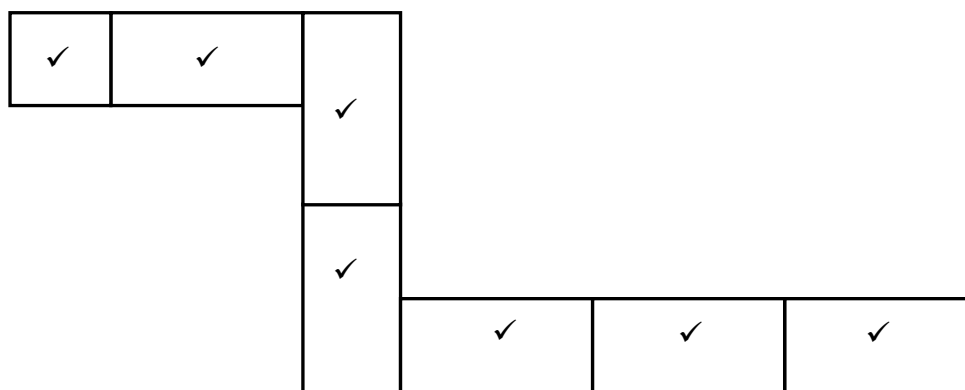
3.8 Area of base  $\times$  height  $\checkmark$  **OR**  $S \times S \times S$  **OR**  $S^3$ 

(1)

3.9 1 000 litres  $\checkmark$ 

(1)

3.10



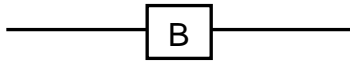
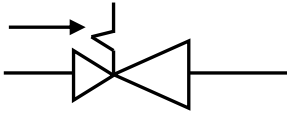
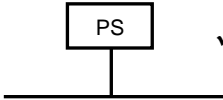

NO	ASSESSMENT CRITERIA	MARK
1	Half brick in correct position	1
2	Full bricks in correct position	6
	<b>TOTAL:</b>	<b>7</b>

(7)

**(30)**

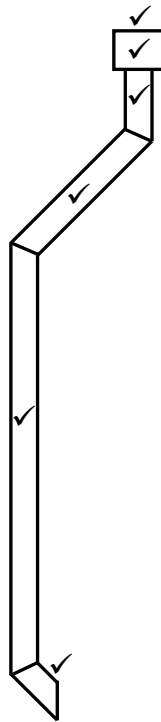
**QUESTION 4: HOT- AND COLD-WATER SUPPLY, TOOLS, EQUIPMENT AND MATERIALS (SPECIFIC)**

- 4.1      4.1.1      • Full-way valve ✓  
                         • Gate valve (1)
- 4.1.2      A – Hand wheel/Wheel ✓  
                         B – Valve head ✓  
                         C – Valve body ✓ (3)
- 4.1.3      The tapered gate (**D**) is used to open or shut off the water flow  
                         when necessary. ✓ (1)
- 4.1.4      • Part **D** will move upwards. ✓  
                         • The tapered gate will open.  
                         • The water will start to flow.  
                         **ANY ONE OF THE ABOVE** (1)
- 4.2      A pillar tap is fitted to the sanitary fitting itself in a vertical position and is  
                 provided with a long leg to allow it to be fitted to the surface of a sanitary  
                 fitting. ✓  
                 A bibcock is fitted to the pipework in the wall. ✓ (2)
- 4.3      4.3.1      F ✓ (1)
- 4.3.2      G ✓ (1)
- 4.3.3      E ✓ (1)
- 4.3.4      A ✓ (1)
- 4.3.5      B ✓ (1)
- 4.3.6      C ✓ (1)
- 4.3.7      H ✓ (1)
- 4.3.8      J ✓ (1)
- 4.4      4.4.1      Dumpy level ✓ (1)
- 4.4.2      Centrifugal pump ✓ (1)
- 4.4.3      Drain cleaning machine/Jetting machine ✓ (1)
- 4.5      Place a bottle/brick/solid object ✓ inside the cistern ✓ to limit the volume of  
                 water used to fill the cistern. (2)
- 4.6      Ball valve/Flush valve/Float valve ✓ (1)

- 4.7 4.7.1 The vacuum breaker allows air to enter the pipe when needed to prevent siphonage. ✓ (1)
- 4.7.2 Pressure control valve ✓ (1)
- 4.7.3 Stopcock/Full-way valve ✓ (1)
- 4.7.4 Cold ✓ - Cold water enter at the bottom of the geyser and hot water will exit at the top of the geyser. ✓ (2)
- 4.7.5 Drip tray ✓ (1)
- 4.8 4.8.1  ✓ ✓ (2)
- 4.8.2  ✓ ✓ (2)
- 4.8.3  ✓ ✓ OR  (2)
- 4.9 4.9.1 An airlock ✓ (1)
- 4.9.2
- Pipes that are shorter than 1 m must be installed horizontally or with an upward slope in the direction of flow. ✓
  - If the pipe is longer than 1 m it must be installed horizontally with an upward slope in the direction of flow.
  - Vent valves can be installed in the pipeline.
- ANY ONE OF THE ABOVE** (1)
- 4.10 This problem can be avoided by:
- Using the same type of material (metal) throughout a system. ✓
  - Using a non-metallic coupler when joining copper to galvanised pipes. ✓ (2)
- 4.11 4.11.1 Hydrochloric acid ✓ (1)
- 4.11.2 Dezincification ✓ (1)
- [40]**

**QUESTION 5: GRAPHICS AS MEANS OF COMMUNICATION, ROOF WORK AND STORM WATER (SPECIFIC)**

5.1



(6)

5.2

- The concrete shoe channels water away from the house/building ✓
- The surface channel channels the water to rivers/dams. ✓

(2)

5.3

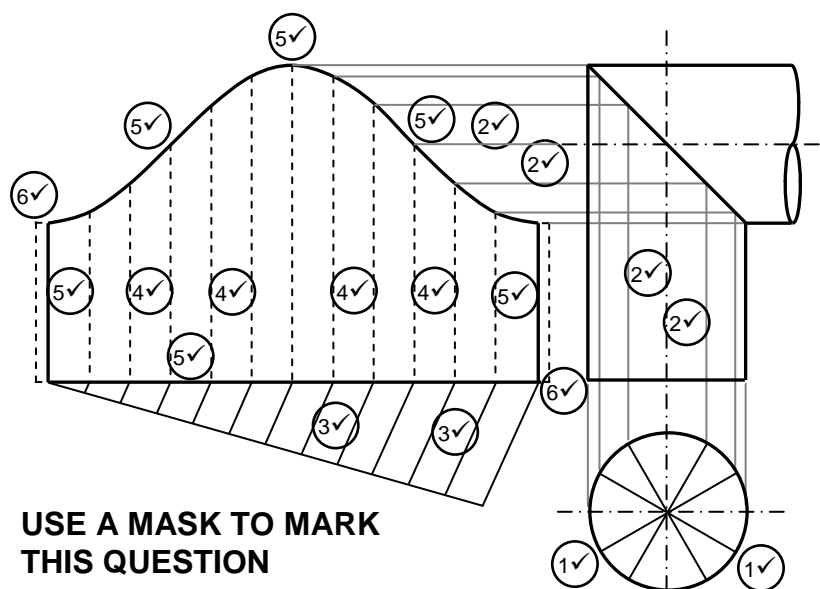
Flashing:

- Copper ✓
- Galvanised sheet metal ✓
- Lead
- Bitumastic patents
- Rubber sealant
- Flash Harry (membrane with water proofing compound)

**ANY TWO OF THE ABOVE**

(2)

5.4



**USE A MASK TO MARK  
THIS QUESTION**

**Note: Candidates may use any of the following methods to divide the plan view into 12 parts.**

- Transfer distance from top view.
- Calculate circumference and divide by 12.
- Construction to divide line into equal parts.

NO.	ASSESSMENT CRITERIA	MARK
1	Dividing circle in 12 parts (top view)	2
2	Projection lines from top and front view	4
3	Dividing development into 12 parts	2
4	Folding lines of development	4
5	Outside lines of developments	6
6	3 mm seam on both sides	2
	<b>TOTAL:</b>	<b>20</b>

(20)  
[30]

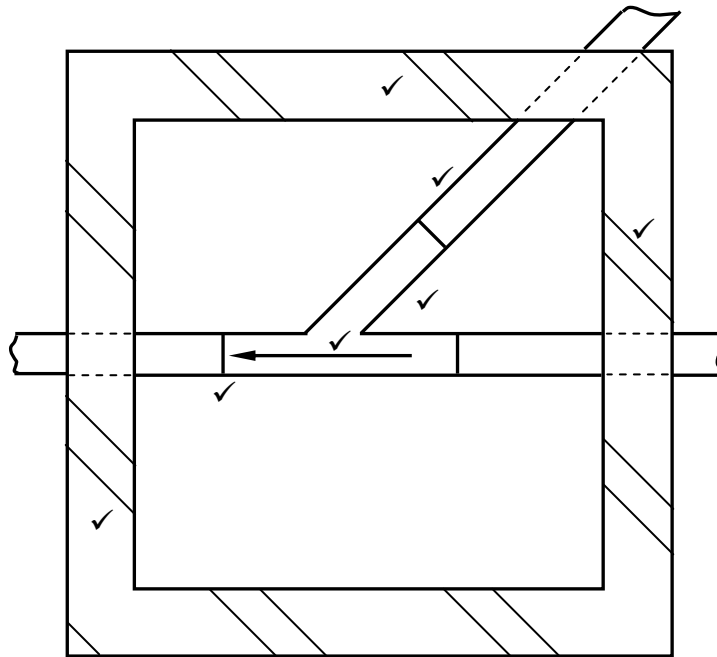
**QUESTION 6: SEWERAGE, SANITARY FITTINGS AND JOINING (SPECIFIC)**

- |     |       |   |     |
|-----|-------|---|-----|
| 6.1 | 6.1.1 | A ✓   | (1) |
|     | 6.1.2 | D ✓   | (1) |
|     | 6.1.3 | A ✓   | (1) |
|     | 6.1.4 | C ✓   | (1) |
|     | 6.1.5 | C ✓   | (1) |
| 6.2 | 6.2.1 | <ul style="list-style-type: none"> <li>• Rivet gun ✓</li> <li>• Pop rivet gun</li> </ul>  | (1) |
|     | 6.2.2 | <ul style="list-style-type: none"> <li>• Steel ✓</li> <li>• Stainless steel</li> </ul>  | (1) |
|     | 6.2.3 | <ul style="list-style-type: none"> <li>• Aluminium ✓</li> <li>• Stainless steel</li> </ul>  | (1) |
| 6.3 | 6.3.1 | <b>A</b> – PVC waste bend 90° with inspection eye ✓<br><b>B</b> – PVC pipe 40/50 mm ✓<br><b>C</b> – Holder bat ✓<br><b>D</b> – Sink waste fitting/Outlet ✓  | (4) |
|     | 6.3.2 | To secure the pipe to the wall. ✓   | (1) |
|     | 6.3.3 | <ul style="list-style-type: none"> <li>• P – trap ✓</li> <li>• S – trap ✓</li> </ul>  | (2) |
|     | 6.3.4 | The water forms a water seal to prevent bad smells and odours rising from the system to escape. ✓   | (1) |
|     | 6.3.5 | The grid can be blocked by greasy residue or leaves that collect on the grating. ✓  | (1) |
| 6.4 |       | <ul style="list-style-type: none"> <li>• An overflow outlet allows excess water to flow through it to the waste pipe. ✓</li> <li>• It will prevent the sanitary fitting from overflowing if a tap was left open and the plug is in the outlet. ✓</li> </ul> | (2) |
| 6.5 |       | <ul style="list-style-type: none"> <li>• Bath ✓</li> <li>• Wash basin ✓</li> </ul>  | (2) |
| 6.6 |       | Rodding eye - Provide access to the interior of a sewerage system. ✓<br>Stop end – Stop the water flow at the end of the pipe. ✓  | (2) |

- 6.7      6.7.1      Ceramics:
- A pleasant, glazed surface ✓
  - Available in a variety of colours
  - Fireclay is mostly used
  - It is strong
  - It is durable
- ANY ONE OF THE ABOVE** (1)
- 6.7.2      Terrazzo:
- Very expensive ✓
  - Very hard to handle
- ANY ONE OF THE ABOVE** (1)
- 6.8        ✓✓  
RWS (2)
- 6.9      Working process of a septic tank:
- Sewerage enters the septic tank from the fitment into the first chamber through the inlet pipe. ✓
  - Heavier particles sink to the bottom of this chamber. ✓
  - Bacteria break the solid waste down into a liquid. ✓
  - The sludge stays at the bottom of the tank. ✓
  - All decomposed solids flow into the second chamber. ✓
  - Only liquid flows from the second chamber through the outlet pipe into the French drain. ✓
  - Sludge must be cleaned out at regular intervals by means of a special truck. (6)



6.10



NO.	ASSESSMENT CRITERIA	MARK	CANDIDATE'S MARK
1	Walls	2	
2	Hatching	1	
3	Pipes	2	
4	Angle of junction	1	
5	Direction of flow	1	
	<b>TOTAL:</b>	<b>7</b>	

(7)  
[40]**TOTAL: 200**