**EC - LEARNER SUPPORT MATERIAL: CIVIL TECHNOLOGY: CIVIL SERVISES: GRADE 11**

**CONTENT TO BE COVERED:**

**TOPIC:**

1. **GRAPHICS AS MEANS OF COMMUNICATION (Generic)**

Make advanced drawings by applying various scales:

- Instrument drawings (related to building industry)
- Orthographic projection with sections
- Different elevations of a building
- Vertical sections indicating labelling and measurements in accordance with the SANS for building drawings
- Isometric views applicable to construction

**Pattern development: Parallel line method**

- Square shaped (square pipe, square elbow)
- Round shaped (cylindrical pipe, cylindrical pipe elbow)

2. **JOINING (Generic)**

Properties, use, precautions and application of the following adhesives:

- Contact glue
- PVC adhesives
- Silicone
- PVA wood glue
- Epoxy
- Mastic sealant

**Joining of pipes**

Explain the various methods of cutting, joining, bending and securing pipe connections and fittings for copper, galvanized pipes and high- and low- pressure polythene pipes

Label and explain the different parts of the joints from sectional sketches

Explain the use of the following fixing agents:

- Chemical anchors
- Sleeve anchors
- Spring toggle fixing

**Sheet metal:**

Drawing and explanation of stages of obtaining:

- Grooved seamed joint
- Overlap joints
- Pop rivet joints
- Solder joints

- Calculating sheet metal allowance for joints taking into account preparation and where used

The student should be able to mark out and cut sheet metal.

### 3. CONSTRUCTION ASSOCIATED WITH CIVIL SERVICES (Subject specific)

**Concrete:**

- Methods and purpose of curing of concrete
- Simple floor slabs e.g. slab for manhole
- Placing of concrete
- Compacting of concrete
- Levelling of concrete

**Brickwork: Drawings of:**

- Front views
- Sectional views
- Consecutive layers as seen from above
- T-junction of half brick wall and one brick wall in stretcher bond four courses high

### 4. ROOF WORK (Subject specific)

**Gutters:**

Drawings (Development) of corners, outlets and stop ends for rectangular gutters

### 5. STORM WATER (Subject specific)

**Storm water:**

The methods of disposing large quantities of water from a dwelling to the municipal storm water system

## EXAMPLE 1: QUESTION 1: GRAPHICS, ROOF WORK AND STORM WATER

Start this question on a NEW page.

1.1 State TWO safety rules that must be observed while soldering. (2)

1.2 State TWO uses of soldering wire. (2)

1.3 State ONE use of ceramics. (1)

1.4 **FIGURE 1.4** below shows different tools used in sheet metalwork.

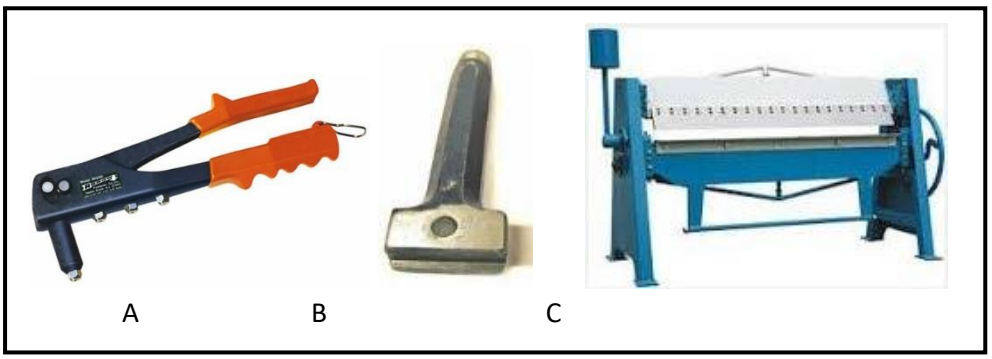



**FIGURE 1.4**

1.4.1 Identify tools **A**–**C** in **FIGURE 1.4.** (3)

1.4.2 Explain ONE use of EACH of these tools. (3)

1.5 Make a neat freehand sketch of a grooved seam lap joint with edges interlocked before it is finished with tool B, in FIGURE 1.4. (2)

1.6 Make a neat freehand drawing of the development of the stopped end of a square gutter with an open top.

Show the following on your drawing:

- End cap
- THREE sides unfolded
- Seam allowance for soldering at the bottom (4)

1.7 Explain what *storm water* is. (1)

1.8 **FIGURE 1.8** is a drawing of the shoe of a square gutter. Develop and draw the development of part A of the shoe. Use scale 1: 1. Show 4 mm for the seam allowance on either side of the development. (12)

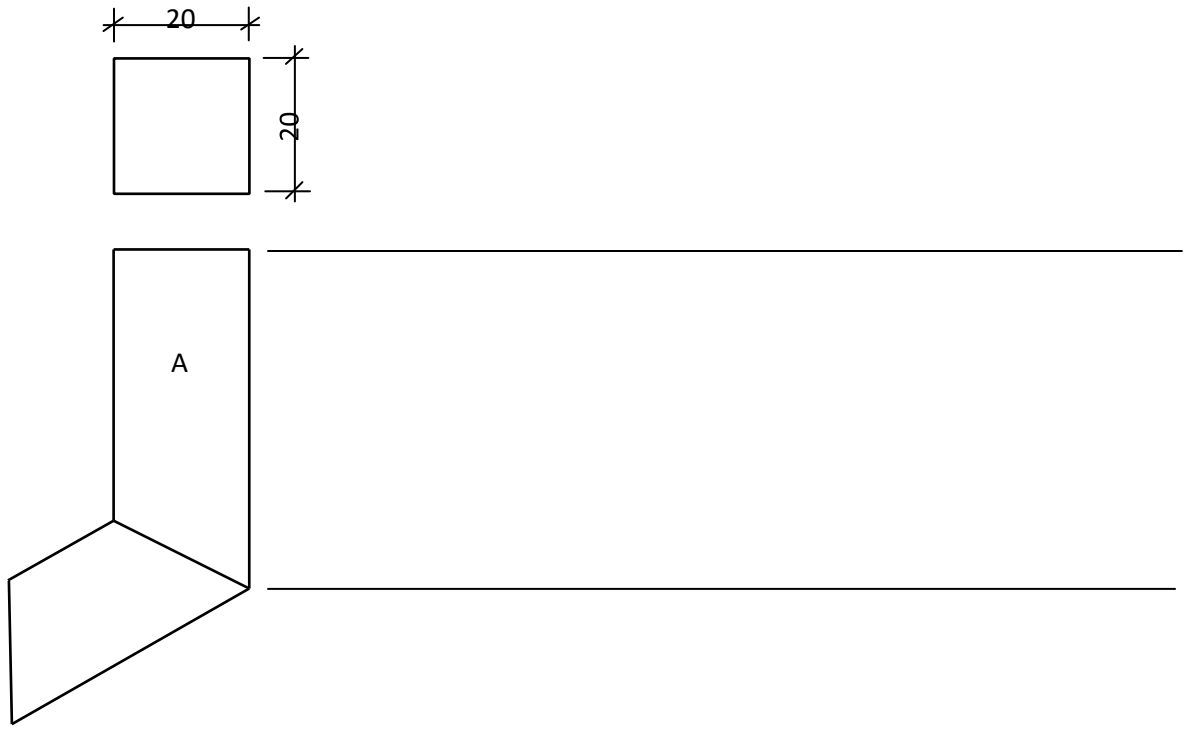



**FIGURE 1.8**

**[30]**

**ANSWER 1: QUESTION 1: GRAPHICS, ROOF WORK AND STORM WATER.**

1.1
- Never touch the element of a soldering iron as it is hot (it can burn you). √
- The cleaning sponge must be kept wet while you are soldering. √
- Always return the soldering iron to its holder or stand.
- Never put the hot iron on the work bench.
- When working with flux and solder, wear eye protection (solder can splash or splatter).
- Cleaning solvents must be kept in a bottle to prevent inhalation.
- Work in a well-ventilated area as lead can give off fumes during soldering; a mask can therefore be worn if preferred.
- Avoid breathing in the fumes by keeping your head to one side of the work instead of directly above the work.

**ANY TWO OF THE ABOVE OR ANY OTHER ACCEPTABLE ANSWER FOR EACH** (2)

1.2
- Used to join/solder two pieces of metal or pipes together √
- To cover the tip of the soldering iron with a thin layer of tin or solder √

(2)

1.3

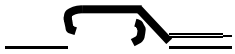
• Floor tiles √

- Wall tiles
- Baths, washbasins and water closets
- Where materials are needed that require resistance against high temperatures

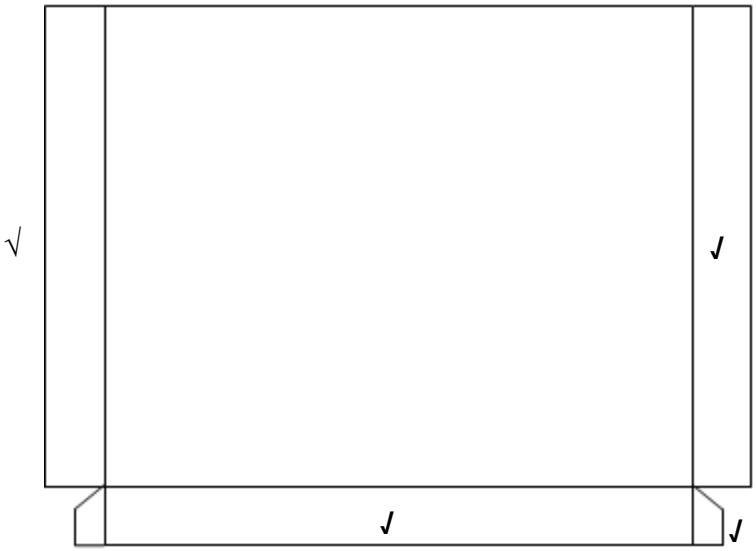
(1)

1.4 1.4.1 A- Pop rivet gun √ (1)
B- Grooving tool √ (1)
C- Sheet-bending machine √/Box and pan bending machine (1)

1.4.2 A- Securing rivet pins in thin sheets/sheet metal √ (1)
B- Straightening a rolled seam joint √ (1)
C- Bending sheet metal to specific shapes/specifications √ (1)

1.5  √√

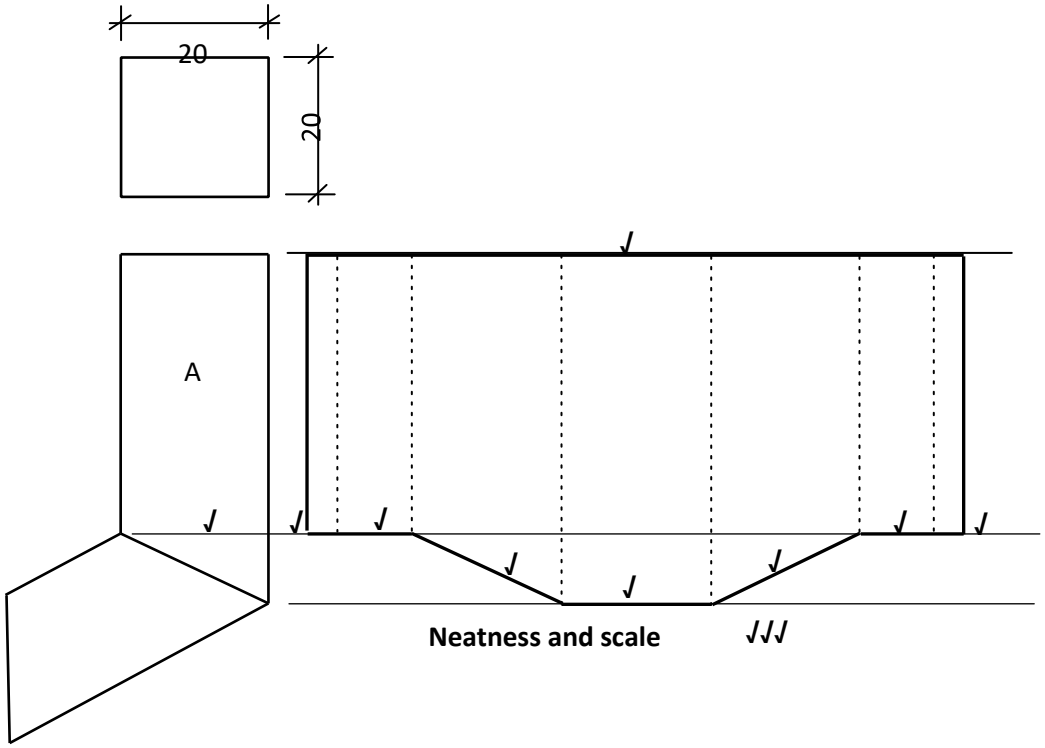
(2)

1.6 

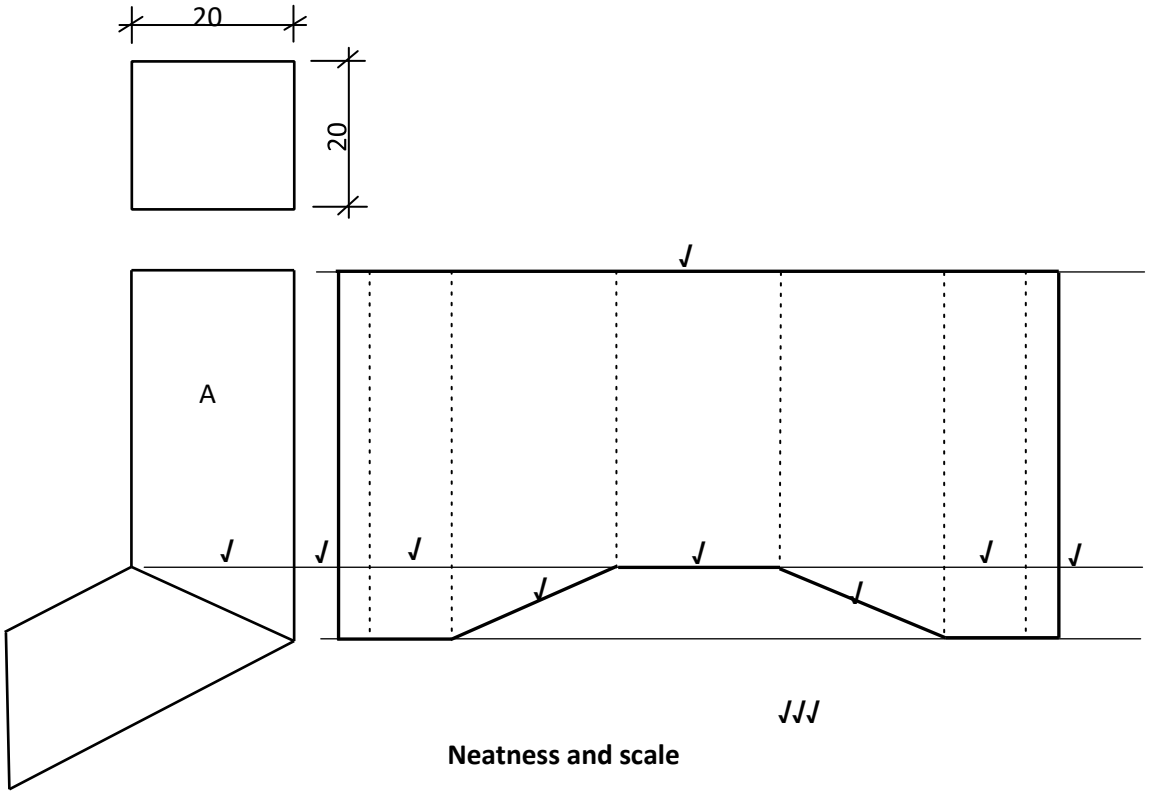

(4)

1.7 Storm water is a large quantity of run-off water from rain, hail and/or snow that flows over the ground and has to be carried away to prevent flooding or dangerous pooling. √ (1)

**1**.8




**OR**



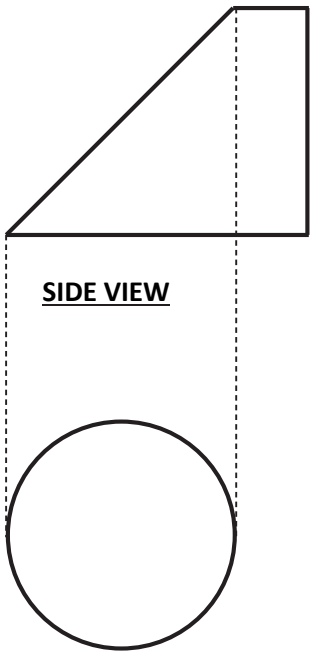

**NOT TO SCALE: USE A MASK TO MARK THIS QUESTION.**

(12)

**[30]**

**EXAMPLE 2: QUESTION 2: GRAPHICS AND CONSTRUCTION IN CIVIL SERVICES (SPECIFIC)**

2.1 **FIGURE 2.1** shows a 45° cut-off cylindrical pipe. Develop and draw the development of the cut-off of the cylindrical pipe to scale 1: 1.




(14)

2.2 Answer the following questions with regard to the sink installation in **FIGURE 2.2.**

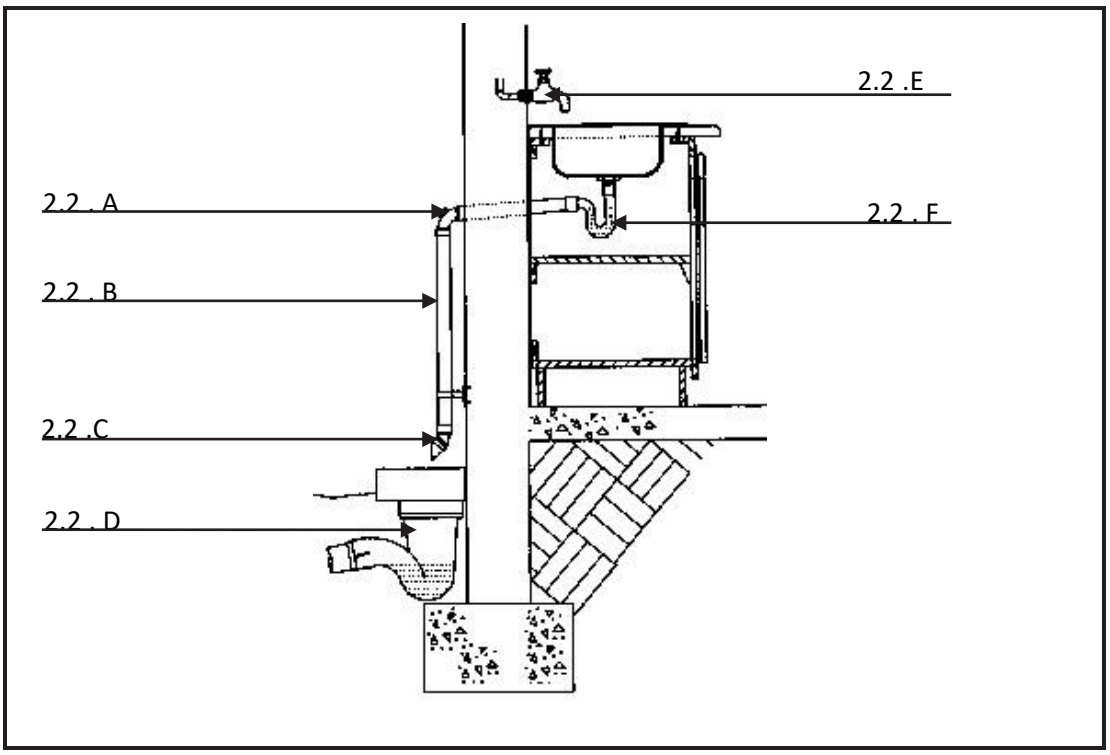



**FIGURE 2.2**

2.2.1 What is the pipe at 2.2.A called? (1)

2.2.2 What is the access opening at part 2.2.A called? (1)

2.2.3 At what angle is the pipe at 2.2.A bent? (1)

2.2.4 What is the pipe at 2.2.B called? (1)

2.2.5 What is the section size of the pipe at 2.2.B? (1)

2.2.6 At what angle is the pipe at 2.2.C bent? (1)

2.2.7 Name parts 2.2.D tot 2.2.F. (3)

2.3 Make a neat section-view sketch to illustrate the construction of a straight capillary soldering joint for copper pipes. (2)

2.4 Choose the term from **COLUMN B** that matches the description in **COLUMN A.** Write only the letter (A–C) next to the question number (2.4.1–2.4.3 for example 2.4.4 F.

| COLUMN A | COLUMN B |
|---|---|
| 2.4.1 Fresh concrete is covered with damp hessian | A Floating |
| 2.4.2 Formwork for fresh concrete | B Concrete placing |
| 2.4.3 Tampers are used to fill all holes and corners with concrete | C Compacting |
| | D Curing |
| | E Plywood boards |

(3 x 1) (3)

2.5 What is the minimum thickness of the following concrete parts?

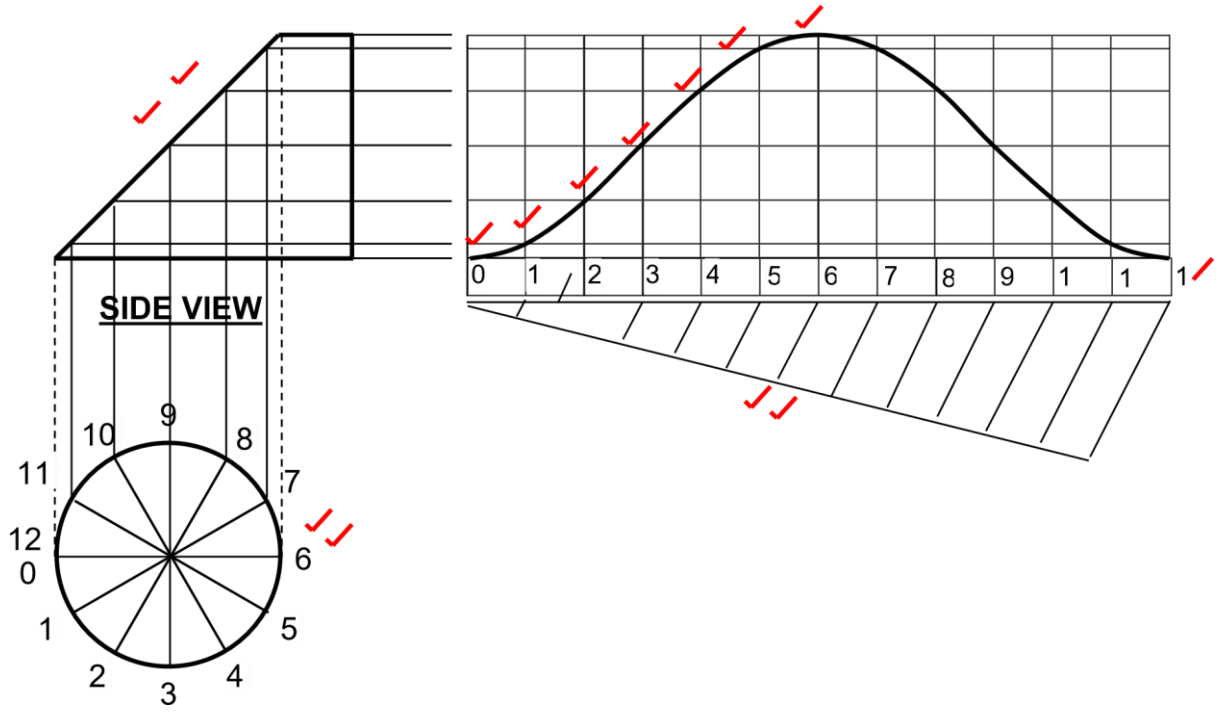
2.5.1 Domestic floor slabs (1)

2.5.2 Manhole slab (1)

**[30]**

**ANSWER 2: QUESTION 2: GRAPHICS AND CONSTRUCTION IN CIVIL SERVICES (SPECIFIC)**

2.1 **FIGURE 2.1** shows a 45° cut-off cylindrical pipe. Develop and draw the development of the cut-off of the cylindrical pipe to scale 1: 1.




(14)

2.2 2.2.1 Waste water bend (1)

2.2.2 Inspection eye (1)

2.2.3 87,5°. (1)

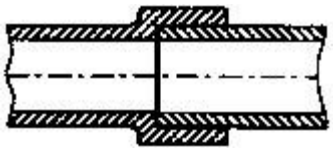
2.2.4 Waste water pipe (1)

2.2.5 40/50 mm (1)

2.2.6 135° (1)

2.2.7 D – Gully E – Pillar tap F – P-trap (3)

2.3 Illustrate a straight capillary soldering joint for copper pipes.



(2)

2.4 2.4.1 D – Curing

2.4.2 E – Plywood boards

2.4.3 C – Compacting (3 x 1) (3)

2.5 2.5.1 100 mm (1)

2.5.2 150 mm (1)

**[30]**

**EXAMPLE 3: QUESTION 3: GRAPHICS, CONSTRUCTION AND JOINING (SPECIFIC)**

3.1 **FIGURE 3.1** shows the plan and elevation of a square downpipe. Develop and draw the development of the square downpipe on scale 1: 1.

3.2 Briefly motivate why concrete must be cured. (2)

3.3 Name TWO defects in concrete which are caused by inadequate curing. (2 x 1) (2)

3.4 Answer the following questions with regard to the wall construction in **FIGURE 3.4.**

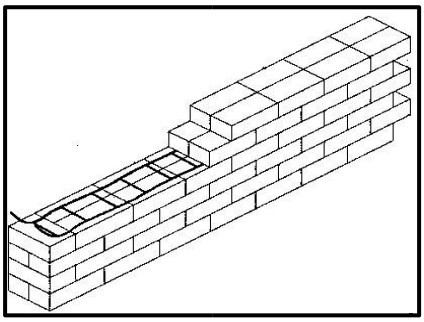


**FIGURE 3.4**

3.4.1 What is this type of wall called? (1)

3.4.2 In which bond is this wall built? (1)

3.4.3 What is the thickness of the wall? (1)

3.5 Describe the consequences of a water supply pipework installation which has not been sturdily secured to the structure. (2)

3.6 Answer the following question with regard to pipe connection in **FIGURE 3.6:**

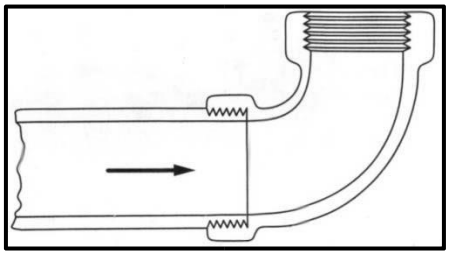


**FIGURE 3.6**

3.6.1 Which type of pipe is connected with this type of fitting connection? (1)

3.6.2 Describe the method which must be used to ensure a water tight connection. (1)

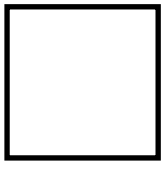
3.7 Briefly describe the working of a spring toggle bolt which makes it ideal for securing against drywalls. (2)

3.8 Make a neat sketch to illustrate the shape of a grooved seam joint in sheet metal. (1)

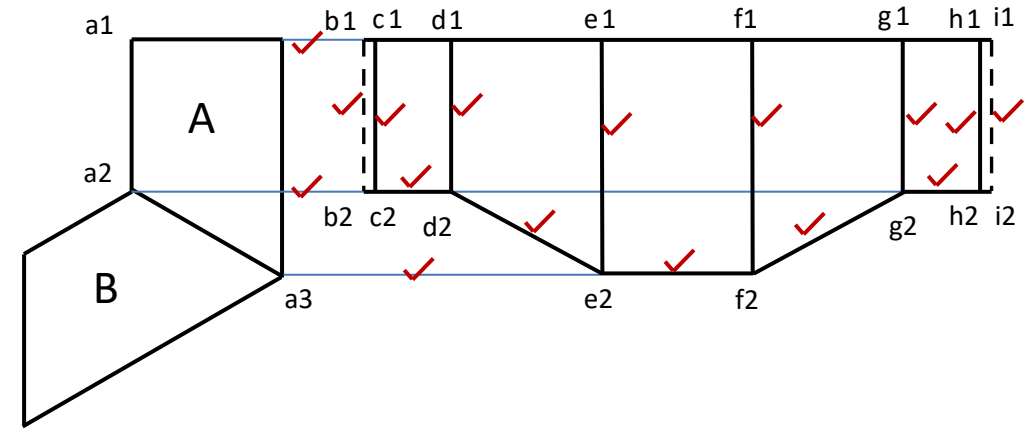
**[30]**

**ANSWER 3: QUESTION 3: GRAPHIC, CONSTRUCTION AND JOINING (SPECIFIC)**

3.1 **FIGURE 3.1** shows the plan and elevation of a square down pipe. Develop and draw the development of the square down pipe on scale 1: 1.



**PLAN VIEW**




**ELEVATION VIEW**

(16)

| | | |
|---|---|---|
| Base lines: a1-i1, a2-12, a3-f2 | 3 | |
| Seam lines: b1-b2, i1-i2 | 2 | |
| Vertical construction lines: c1-c2 tot h1-h2 | 6 | |
| Intersection lines: c2-d2, d2-e2, e2-f2, f2-g2, g2-h2 | 5 | |
| **TOTAL:** | **16** | |

3.2 (1) Protection against drying out / keeping damp so that (2) hydration process / hardening process can complete. (2)

3.3 Any TWO defects in concrete which is caused by inadequate curing.

- Low strength
- High permeability
- Shrinkage
- Cracks
- Dusting
- Crazing (2 x 1) (2)

3.4 3.4.1 Single brick wall (1)

3.4.2 Stretcher bond (1)

3.4.3 220 mm (1)

3.5 (1) Pipes will rattle / vibrate and (2) cause stress / leaks in pipe joints. (2)

3.6 3.6.1 Galvanised pipes (1)

3.6.2 To bind thread with teflon-tape (1)

3.7 (1) Spring action of wings (2) spread against the back of the board. (2)

3.8 Make a neat sketch to illustrate the shape of a grooved seamed joint in sheet metal. (1)

**[30]**