

UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE  
General Certificate of Education Ordinary Level

**METALWORK**

**6040/1**

PAPER 1 Theory, Drawing and Design

**OCTOBER/NOVEMBER SESSION 2002**

2 hours 45 minutes

Additional materials:

Answer paper

A2 drawing paper (1 sheet)

Standard drawing equipment

**TIME** 2 hours 45 minutes

### **INSTRUCTIONS TO CANDIDATES**

Write your name, Centre number and candidate number in the spaces provided on the answer paper/answer booklet.

#### **Section A**

Answer any **three** questions.

Write your answers on the separate answer paper provided.

#### **Section B**

Answer **all** questions.

Use the A2 sheet of drawing paper prepared prior to the examination for your answers.

At the end of the examination, fasten together the separate answer paper for Section A and place it within your folded drawing paper for Section B.

### **INFORMATION FOR CANDIDATES**

The number of marks is given in brackets [ ] at the end of each question or part question.

All dimensions are in millimetres unless otherwise stated.

Except where pictorial views are used **all** diagrams are in First Angle Projection.

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**This question paper consists of 11 printed pages and 1 blank page.**

### Section A Theory

Answer any **three** questions in this section.

**Use bold sketches to illustrate your answers wherever possible.**

You are advised to spend 1 hour 15 minutes on Section A.

**1** Metals can be hardened in a number of ways.

**(a)** Name **two** situations for each of the following where the hardening of a metal is:

**(i)** an advantage;

**(ii)** a disadvantage.

[4]

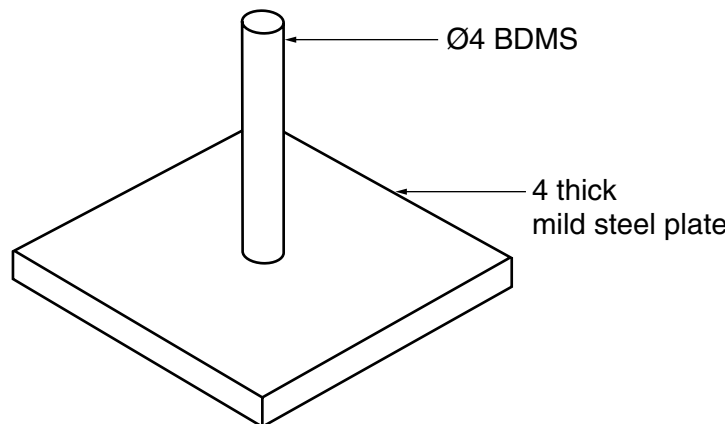
**(b)** Describe in detail how one of the hardening processes named in:

**(i)** **(a)(i)** is carried out;

**(ii)** **(a)(ii)** is reversed.

[6]

**(c)** Fig. 1 shows a rod joined to a base.



**Fig. 1**

**(i)** Show how the rod can be located on the base as shown in Fig. 1 and retained there in preparation for silver soldering. [2]

**(ii)** Describe in detail how to silver solder the rod to the base. [4]

**(iii)** If the base had been 25 mm thick and not 4 mm, how would this make silver soldering more difficult? [1]

2 Fig. 2 shows two plates held together with a bolt and nut.

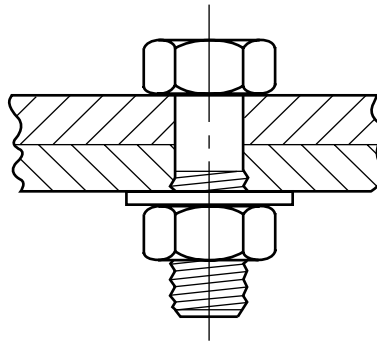


Fig. 2

- (a) (i) Why is part of the bolt shank left unthreaded?  
(ii) What purpose does the washer serve?  
(iii) With the aid of sketches show and name **two** methods of preventing the nut on the bolt from working loose.  
(iv) State how a bolt differs from a set screw. [7]
- (b) A student attempts to thread a rod using a die-stock with a circular split die. At first, the student finds it very difficult to start the thread and later notices the thread is very ragged. When an appropriate nut is located onto the thread it is not only very loose but wobbles when turned. Later, the student attempts to tap a blind hole. Again, the student has difficulty starting, and then once threading has begun the tap breaks.

Draw a chart similar to the one below which lists the six problems encountered by the student and explain how they could have been prevented.

Problem		Prevention
External thread		
1	Difficulty starting	
2	Ragged thread	
3	Loose nut	
Internal thread		
5	Difficulty starting	
6	Tap breakage	

[10]

- 3 Figs. 3.1 and 3.2 show incomplete details of a drawer handle turned from 30 mm square aluminium alloy.

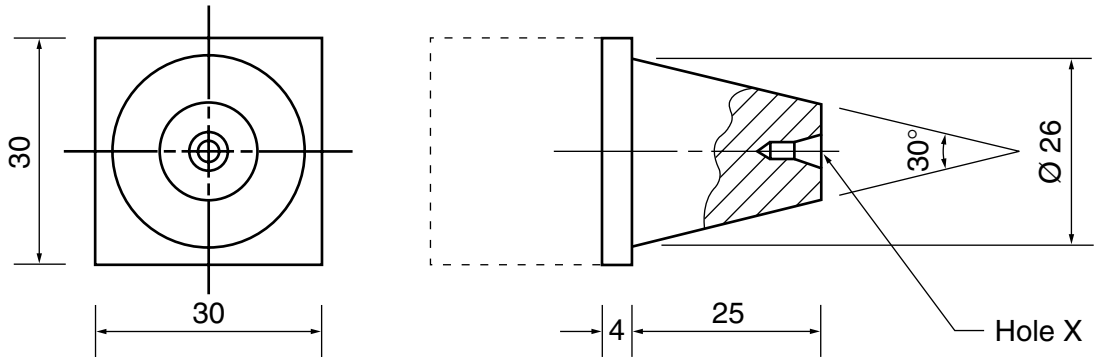


Fig. 3.1

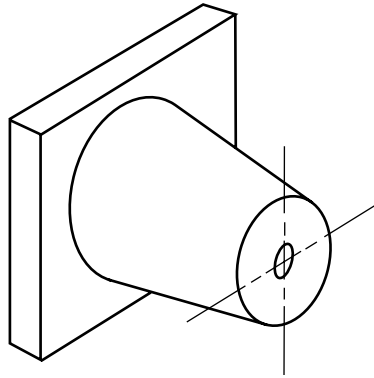


Fig. 3.2

- (a) (i) Name the chuck used to secure the aluminium alloy in the lathe.  
 (ii) Describe a method used to check the accuracy of the chuck setting. [3]
- (b) Identify the tool used to make the hole X and the reason for its use. [2]
- (c) Describe in detail how to:  
 (i) reduce the square bar to  $\text{Ø}26$ ;  
 (ii) produce the taper. [6]
- (d) (i) Explain why parting off the drawer handle from the square bar could be difficult.  
 (ii) Describe in detail how the parting off would be carried out. [6]

4 Fig. 4.1 and 4.2 show details of a shutter catch.

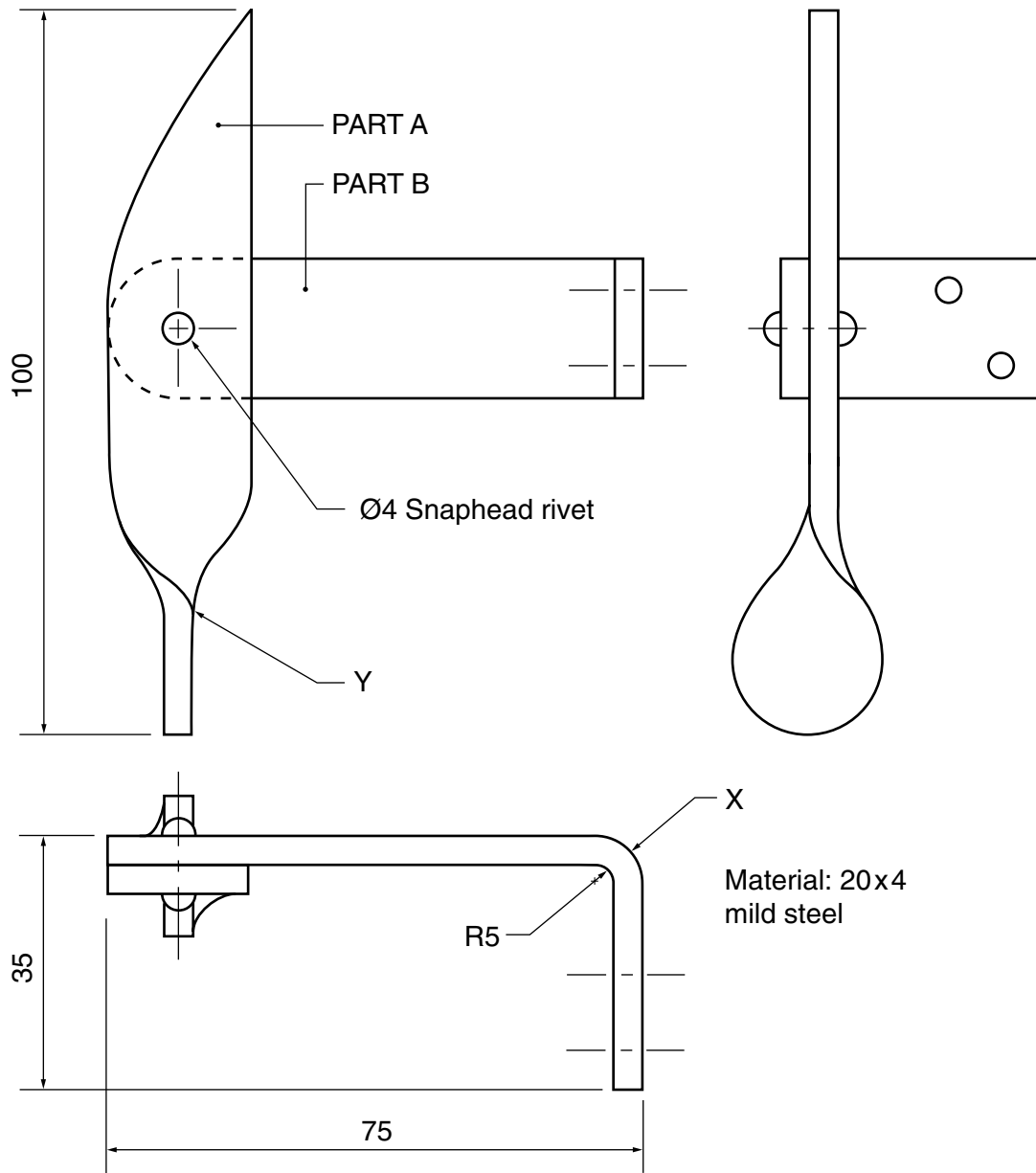
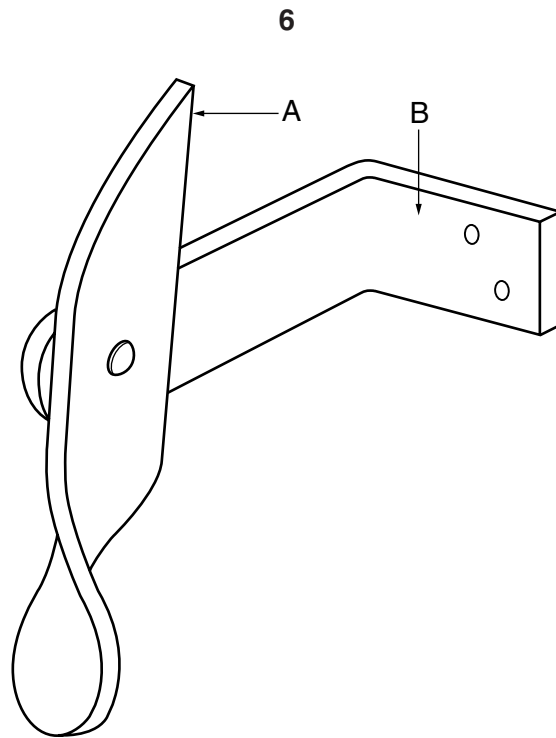


Fig. 4.1



**Fig. 4.2**

- (a)** Describe in detail how to form:
- (i)** the bend at X;
  - (ii)** the twist at Y. [8]
- (b)**
- (i)** A  $\text{Ø}4$  snap head rivet is used for the pivot. Show how to calculate the shank projection needed to form the snap head on the other end.
  - (ii)** Describe in detail how to form the second snap head.
  - (iii)** Describe a method of allowing Part A of the shutter catch to be riveted loosely so that it pivots easily around Part B. [8]
- (c)** Apart from paint, how could the mild steel shutter catch be prevented from rusting? [1]

- 5 Fig. 5.1 shows details of a hollowed sweet dish made from 1 mm thick copper.

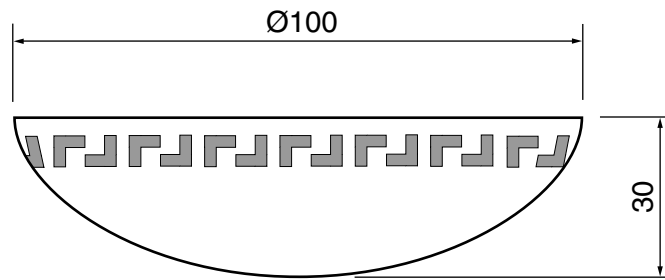


Fig. 5.1

- (a) With the aid of diagrams show how the dish would be:

- (i) hollowed from a prepared disc;
- (ii) planished.

[8]

Fig. 5.2 shows enlarged details of part of the decoration around the dish.

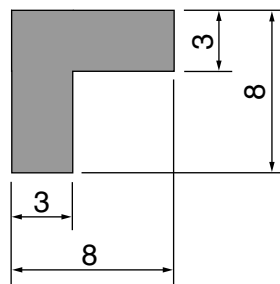


Fig. 5.2

- (b) (i) Name **three** methods that could be used to carry out this decoration.  
(ii) Describe in detail how to undertake one of these decorative processes.

[9]

## Section B Drawing and Design

Answer **all** questions in this section.

You are advised to spend 1 hour 30 minutes on this section.

One sheet of drawing paper of A2 size prepared prior to the examination is to be used.

Set the paper with the long edge to the top of your drawing board and use the space to the right of the line on your paper to make your freehand sketch solutions in answer to Question 6.

**Use only one side of your paper.**

Use your own discretion where dimensions are not given.

The owner of a café with a balcony wishes to install several parasols to shade the café tables. Because of restricted space, the owner wishes to attach the parasols to the guard rail of the balcony as shown in Fig. 6.1 on page 10.

Fig. 6.2 on page 11, shows incomplete details of the fixing device for the parasols. Tube A is attached to the  $\text{Ø}60$  guard rail B. Parasol shaft C is inserted into the  $\text{Ø}30$  tube A and secured at an appropriate height. The parasol can be pivoted from  $90^\circ$  (vertical) to  $120^\circ$  depending on the position of the sun.

- 6 To the right of the line on your paper make a series of sketches leading to the solution of the design problems below. **Brief** notes should be added to identify details such as important sizes and specific materials. It should be possible for the Examiner to understand your solutions from these sketches.

In order to solve the problems, you may incorporate additional parts and make minor modifications to the given components. Adhesives should **not** be used in the assembly.

### Design Problems

A method of:

- (a) attaching the  $\text{Ø}30$  tube A to the  $\text{Ø}60 \times 3$  guard rail B, so that it may be easily removed for storage;
- (b) allowing tube A to pivot and be fixed at any position from  $90^\circ$  to  $120^\circ$  as shown in Fig. 6.2;
- (c) allowing the  $\text{Ø}25 \times 1.5$  plastic coated mild steel parasol shaft C to slide into the  $\text{Ø}30 \times 2 \times 200$  mm mild steel tube A so that the parasol may be adjusted for height and then secured into position.



7 Draw full size in 1st or 3rd angle projection the following views of the parasol fixing device complete with your solutions to the design problems in Question 6. Your drawings are to show tube B in the vertical position. Include hidden detail only if essential for the understanding of your design solutions.

(a) An elevation in direction of arrow E.

(b) A sectional end elevation through the centre of tube B.

Mark allocation:

Communication [24]

Design [25]

10

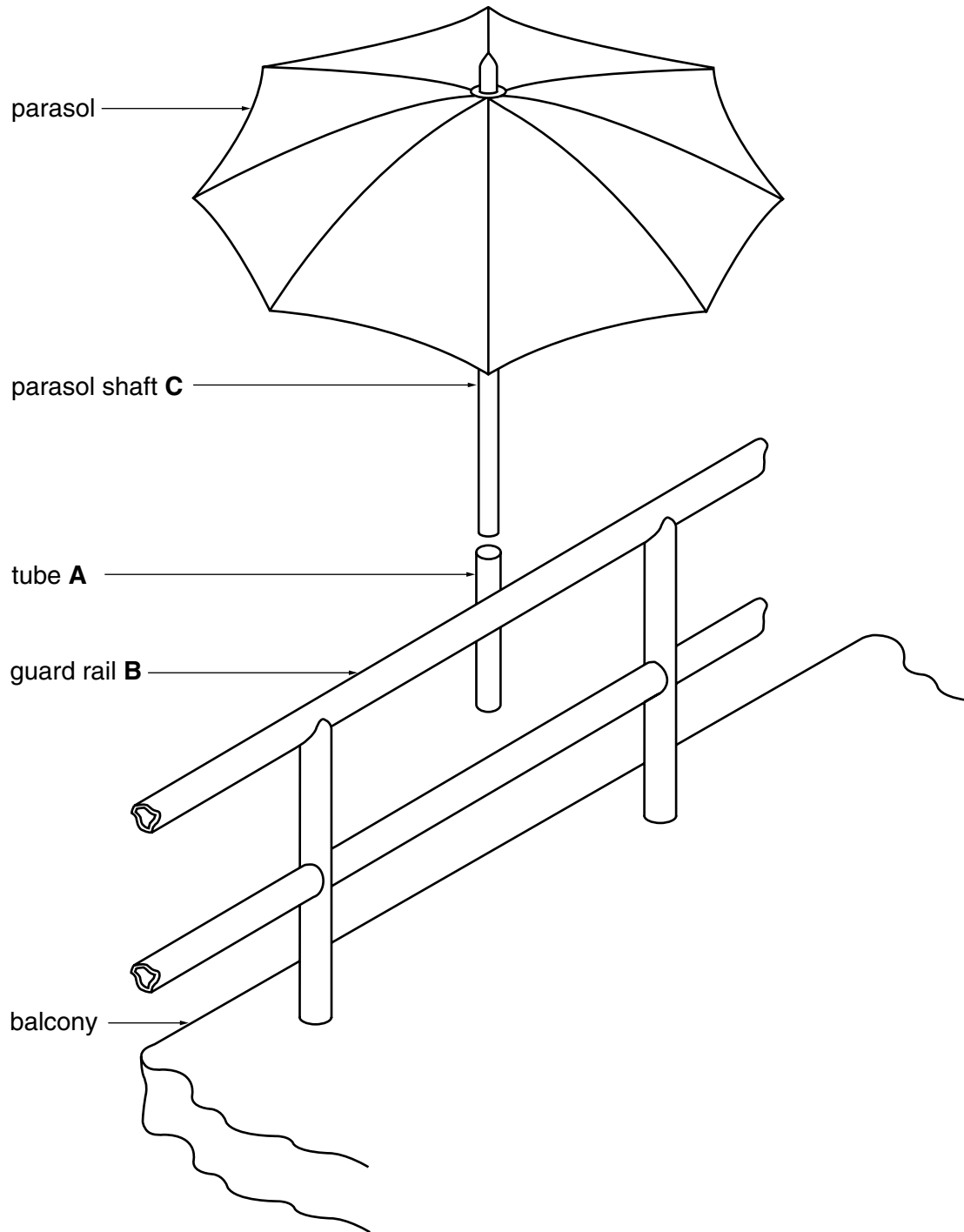
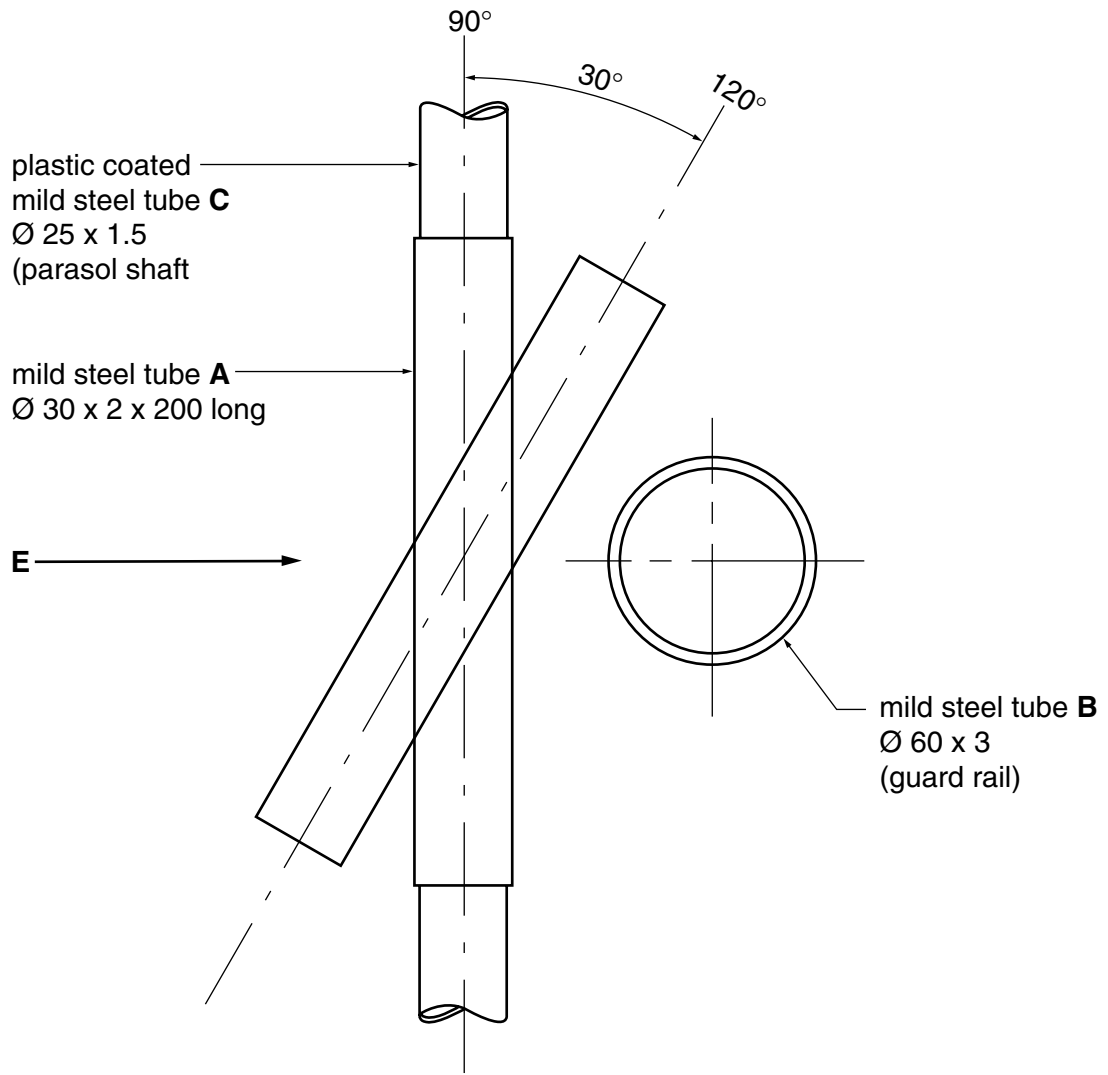


Fig. 6.1

11



END ELEVATION

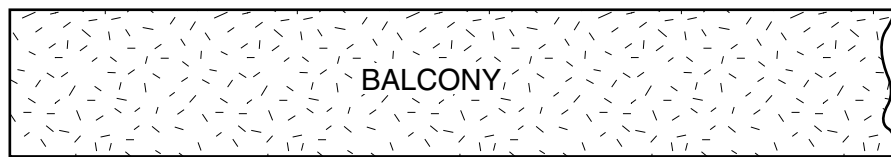


Fig. 6.2

