

**OCR GCSE IN ENGINEERING (DOUBLE AWARD)**

**1492**

**EXEMPLAR MATERIALS**

This collection of exemplar work is designed to accompany OCR GCSE specification Engineering for teaching from September 2002.

First certification will be available in June 2004 and every June thereafter.

This document aims to demonstrate the relationship between candidates' work and the assessment criteria statements. The examples provided represent just a few approaches from a small number of candidates and are not intended to be comprehensive or interpreted prescriptively.

The examples exemplify different standards of work. Some of the examples demonstrate a consistent approach across the objectives, whereas others demonstrate a different standard of achievement for each objective.

Teachers are referred to Section 2.3 of the Teacher Guide (Determining a Candidate's Mark) to further assist their marking.



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# **GCSE Engineering (Double Award)**

## **Unit 1 – Design and Graphical Communication**

### **Egg Timer Project**

## URS: Assessment evidence

- a) Details of the customer design brief, design specification and associated information - a1 a2 a3

The candidate has detailed a customer design brief and, from recommendations made by the customer at a recorded meeting, produced an outline rather than detailed design specification. There is neither justification nor explanation as to how the information from the meeting was used.

### Points 3

- b) Evidence of your technical skills, drawing techniques, and knowledge of drawing standards - b1 b2 b3

The candidate has produced high quality isometric and third angle projection drawings of design ideas and the final design product. The correct conventions have been used for these drawings but there has been no justification of the drawing techniques used.

### Points 4

- c) Identification of the stages in making your design solution with related quality control procedures, including health and safety - c1 c2 c3

There is a brief reference to health and safety in the design brief but this is insufficient when compared to the suggested processes mentioned in the production flow chart. The flowchart does, however, include detail of quality checks that will be carried out at various stages. There is no evidence of evaluation of quality control, assurance or total quality management.

### Points 3

- d) How you communicated your selected design solution to the customer by developing sketches, notes and working drawings - d1 d2 d3

The candidate has used engineering drawings and CAD drawings to present the design to the customer, however there is no evidence of research sketches or modelling. There is a limited evaluation of the final design solution with respect to the customers original design brief.

### Points 4

- e) Consideration of how the final product will be made, identifying the engineering processes and quality standards that will be used to produce it - e1 e2 e3

A flowchart indicating the processes to be involved in the production of the egg timer has been included, indicating stages of quality control. There is limited justification to each of these stages, though the references do relate to 'real world' engineering.

### Points 7

## Total Points 21

## Introduction to Portfolio

This design project is required for part of my unit 1 portfolio for GCSE engineering. Whilst working through this unit I will learn about design processes and quality control procedures. I will also find out how the design process links to the eventual production.



Decisions will have to be made on various issues and I shall justify these decisions in a number of different ways such as meetings and brainstorming sessions. Tolerances and design specifications need to be followed and the production process must be carefully monitored.

My research should be thorough as this will allow me to consider the most suitable design requirements for my own work. Finally I should be satisfied that I have achieved a good result using the resources available to me.



1

March 19<sup>th</sup> 2003

A conversation has taken place between the Managing Director of a North East kitchen manufacturing company and his designer in chief.

**MD:** Recent figures have shown a gradual increase in kitchen sales and whereas I am pleased with this I feel there is still room for improvement. I propose to hold a promotions day in order to increase customer awareness of our competitiveness.

**Designer:** So where do you see my role in all of this?

**MD:** I am looking for a free gift to be given to everyone who attends the promotions day. The gift needs to be reasonably priced as we are going to require about 300.

**Designer:** What do you consider to be a reasonable price?

**MD:** Something that can be produced at somewhere in between £3 to £5.

**Designer:** How about an egg timer?

**MD:** That sounds perfect. It would need to be contemporary though in order to suit our modern thinking image.

**Designer:** Yes. It is my intention that the gift shall be refined, attractive and of good quality. Do you wish it to be wall mounted or free standing?

**MD:** Most definitely portable. One that is able to be stored away with the cutlery etc.

**Designer:** What size would you like it to be?

**MD:** Not too big although it should be large enough to be monitored from anywhere in the kitchen whilst other activities are being carried out.

**Designer:** I would recommend a size of around 80mm x 40mm.

**MD:** That sounds just fine.

**Designer:** As for the material I would suggest a light wood frame and a clear plastic interior in order to watch the sand disperse from the top to the bottom.

**MD:** I'll leave it to you then and speak to you when you've decided which one to go with.

3

## Design Brief

The Managing Director of a kitchen company intends to stage a promotions day in order to attract and encourage more business.

He has asked his chief designer to come up with a gift idea to offer free to everyone who arrives for the promotions day.

The designer has suggested an egg timer and the Managing Director has agreed that this would be ideal.

The company will require 300 of these egg timers and the cost of each one is not to exceed £5.

The egg timer should be of a contemporary style in keeping with the companies image and be attractive to look at.

It should also be lightweight and portable but large enough to be seen from anywhere in the kitchen.

The designer will be working within time restraints as the promotions day is only six weeks away.

The completed egg timer is to meet with all health and safety requirements.

4



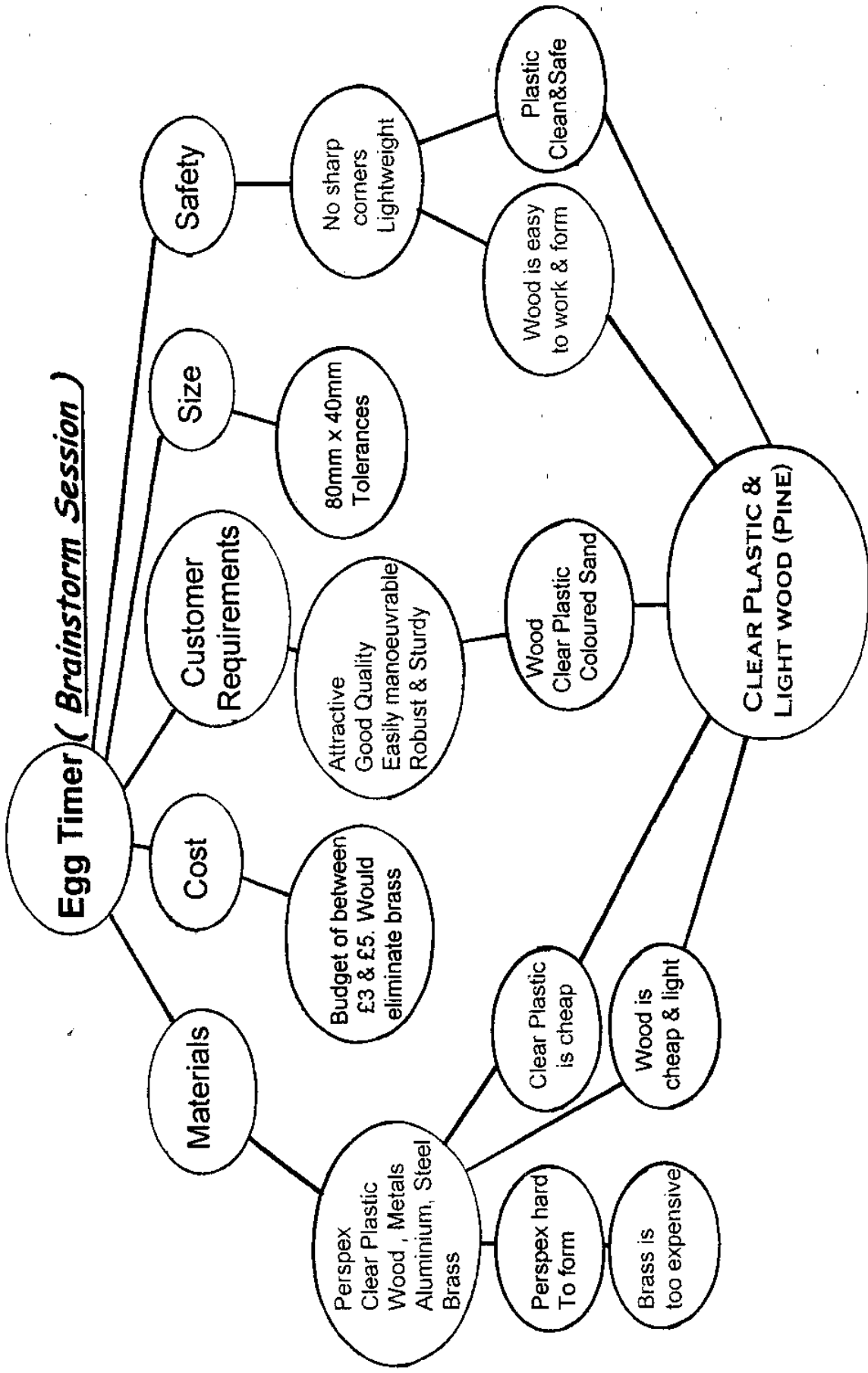
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## Design Specifications

As a result of our recent meeting we are going to produce an egg timer working to the following specifications.

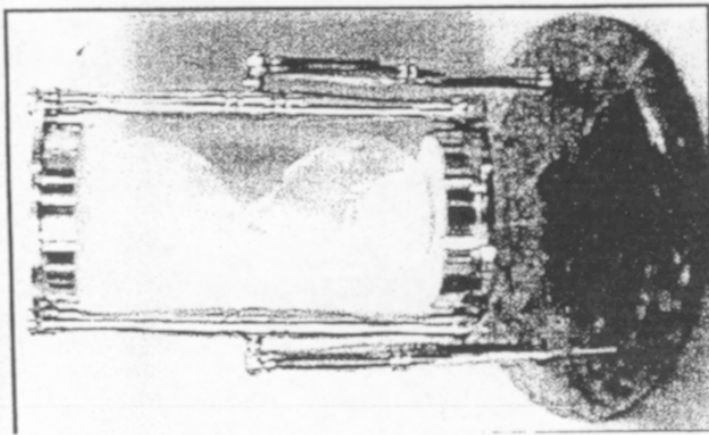
*Our egg timer will be:*

- Attractive and contemporary.
- Portable and easy to store.
- 80mm in height and 40mm in width.
- Easily seen from all areas of the kitchen.
- Constructed from wood and clear plastic.
- Lightweight.
- Costing not more than £5.
- Designed and constructed within 6 weeks.
- Within all recommended tolerances.
- Comply with all health & safety requirements.

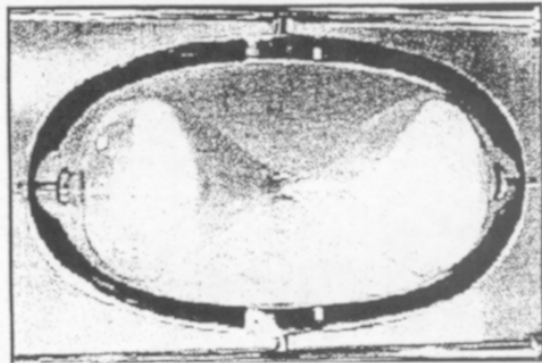


## Research for Design Ideas

Highly salubrious and very attractive appearance this egg timer is constructed from dark green marble and brass. Dimensions are slightly larger than our requirements and the overall specifications are far too demanding. Very expensive indeed.

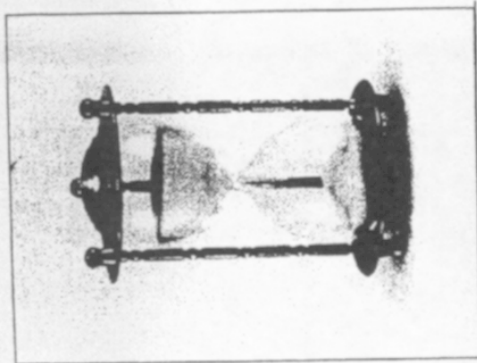


Stainless-steel framework is delicate and swivels with a similar design to the cheval mirror. Dimensions are within our requirements and the clear type timer style is exactly what we want although again time and cost would prove to be too much.

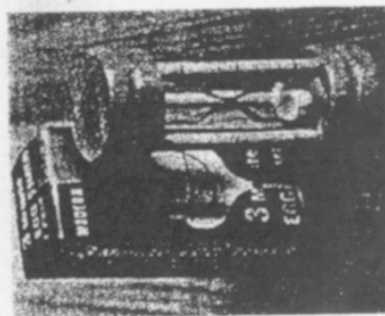


7

### Research for Design Ideas

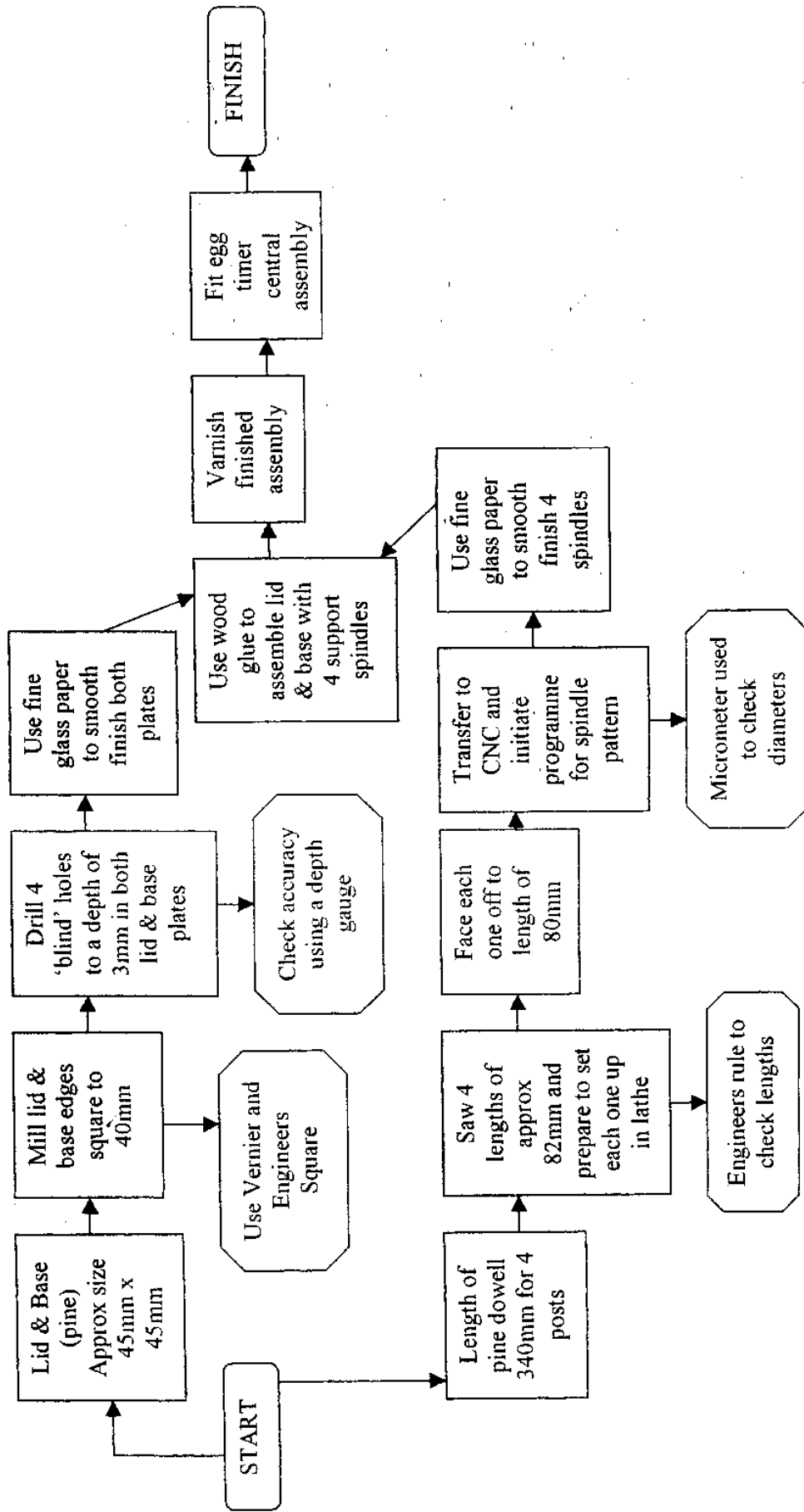


Although a highly attractive design this would prove to be too intricate and time consuming. An advantage of using this material is that it is possible to identify ones own egg timer by having it engraved. Too expensive also.

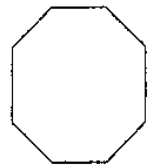


Traditional and fairly common egg timer which would be well within the price constraints to manufacture. Materials are conducive to what we are looking for but again time would probably be against us.

**Engineering Procedures for Construction of Egg Timer**

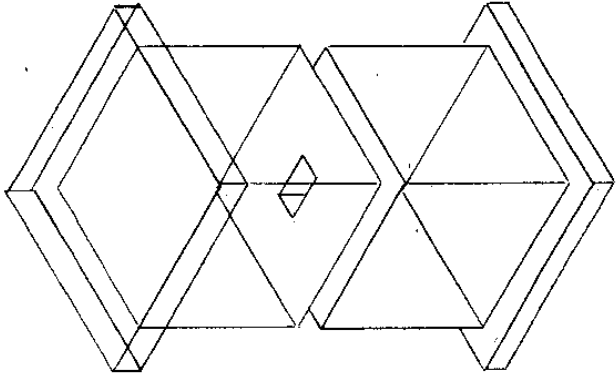


Quality checks are shown in the red boxes. They will be performed to make sure that the manufacture process is tested in stages so that any problems can be found quickly and fixed, not discovered at the end.



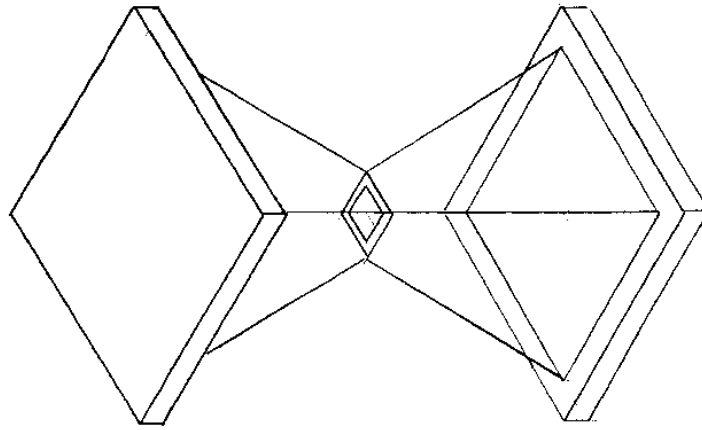
The next four pages have been reduced from A3 sheets,  
which were hand drawn using pencil.

FOR MY FIRST DESIGN,  
 I HAVE USED CLEAR  
 PLASTIC. ALTHOUGH  
 IT LOOKS GOOD I  
 DONT THINK ALL THE  
 SAND WILL RUN AWAY



NAME	UNITS IN MM	ISOMETRIC	TITLE
DATE	SCALE 1:1	PROJECTION	DESIGN IDEA 1

DESIGN TWO IS TWO  
PYRAMIDS MADE  
FROM CLEAR PLASTIC  
ALTHOUGH I LIKE  
THIS DESIGN I THINK  
IT WILL BE TO HARD  
TO MANUFACTURE.



DESIGN 2

ISOMETRIC  
PROJECTION

UNITS IN MM

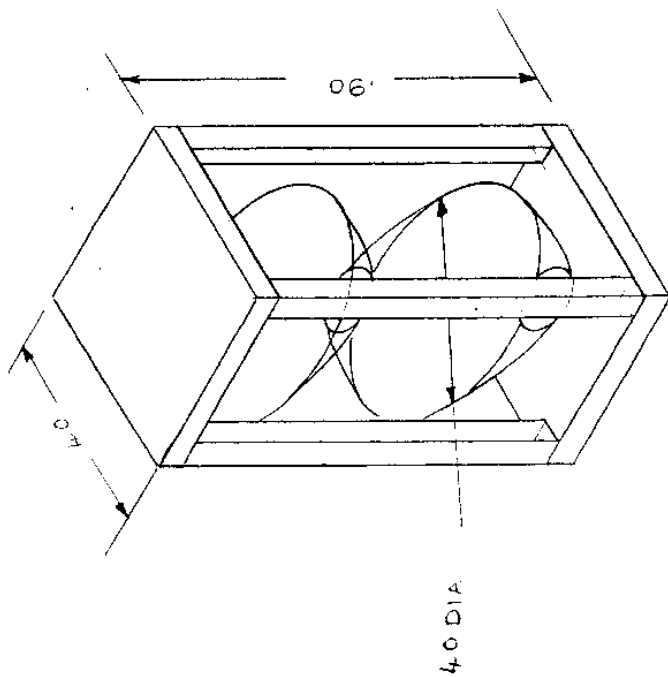
SCALE 1:1

NAME

DATE



DESIGN THREE WILL  
 BE USED AS MY  
 FINAL DESIGN. I FEEL  
 IT MATCHES THE  
 DESIGN BRIEF BEST



DESIGN 3

ISOMETRIC

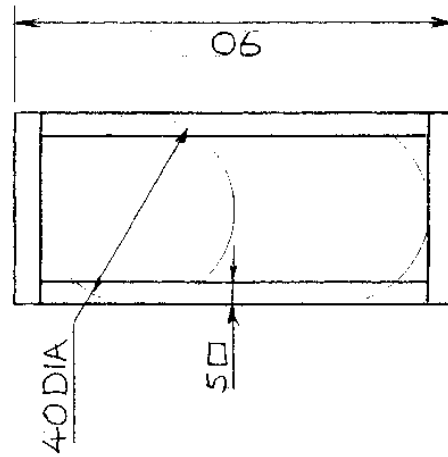
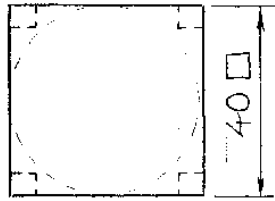
PROJECTION

UNITS IN MM

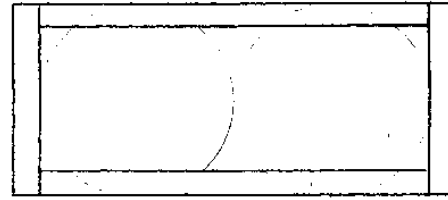
SCALE 1:1

NAME

DATE

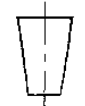


5R



NAME  
DATE

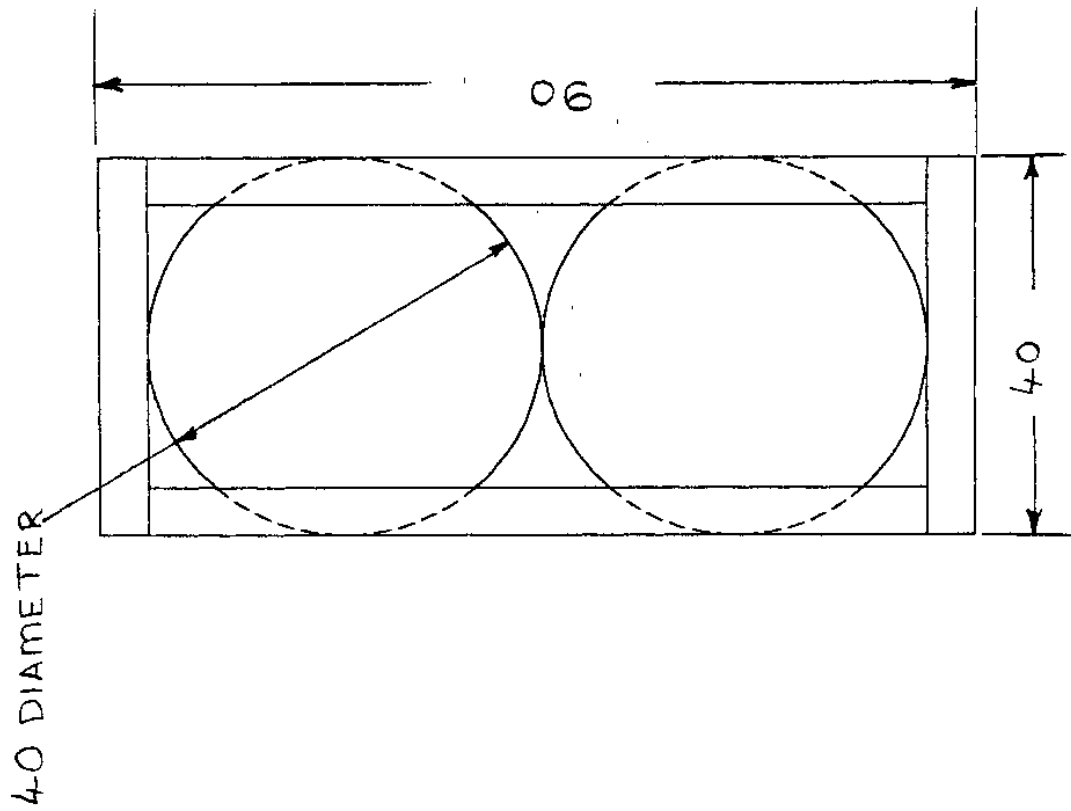
UNITS IN MM  
SCALE 1:1



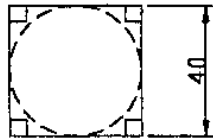
THIRD ANGLE  
PROJECTION

TITLE  
FINAL DESIGN

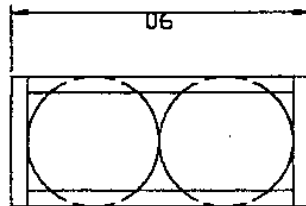
CAD DRAWINGS OF EGG TIMER - FINAL DESIGN



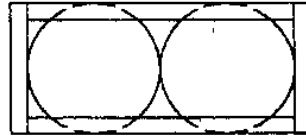
NAME \_\_\_\_\_  
DATE \_\_\_\_\_  
THIRD ANGLE PROJECTION  
SCALE 1:2



PLAN VIEW



FRONT VIEW



SIDE VIEW

## Evaluation of processes and procedures

Time and motion studies are carried out for cost cutting and job estimates. The egg timer construction process that was used was found to be the most suitable.

Quality checks were carried out throughout production in order to achieve consistency.

It was important that all egg timer parts were within tolerance and so equipment such as micrometers and vernier depth gauges were used.

The design which was finally decided upon was one that met with most of the original requirements. It was one that I was particularly pleased with because even though it was very basic it looked good quality.

Specifications in the beginning meant that it had to be contemporary, attractive, portable and reasonably priced and I believe it was all of those things.

If I were to make another one in the future I would probably make the lid and bottom circular and not square so as to improve the appearance even more.

# **GCSE Engineering (Double Award)**

## **Unit 1 – Design and Graphical Communication**

### **Clock Project**

## URS: Assessment evidence

- a) Details of the customer design brief, design specification and associated information - a1 a2 a3

The candidate has included a customer design brief, minutes from a meeting and use of 'brain storming' ideas to produce a design specification. There is, however, no justification nor explanation as to how the information from the meeting was used.

### Points 5

- b) Evidence of your technical skills, drawing techniques, and knowledge of drawing standards - b1 b2 b3

The candidate has produced high quality isometric and third angle projection drawings of design ideas and the final design for the clock. Appropriate conventions have been used for these drawings. However, there has been no justification of the drawing techniques used.

### Points 4

- c) Identification of the stages in making your design solution with related quality control procedures, including health and safety - c1 c2 c3

There is only a brief reference to Health and Safety in the evaluation and this is insufficient given the suggested processes mentioned in the plan of manufacture. The plan of manufacture briefly mentions quality control checks but there is no mention of a final quality check. There is no evidence of evaluation of quality control, quality assurance or total quality management.

### Points 3

- d) How you communicated your selected design solution to the customer by developing sketches, notes and working drawings - d1 d2 d3

The candidate has used engineering drawings and CAD drawings to present the design to the customer. However, there is no evidence of research sketches or modelling. There is only limited evaluation of the final design solution with respect to the customer's original design brief.

### Points 4

- e) Consideration of how the final product will be made, identifying the engineering processes and quality standards that will be used to produce it - e1 e2 e3

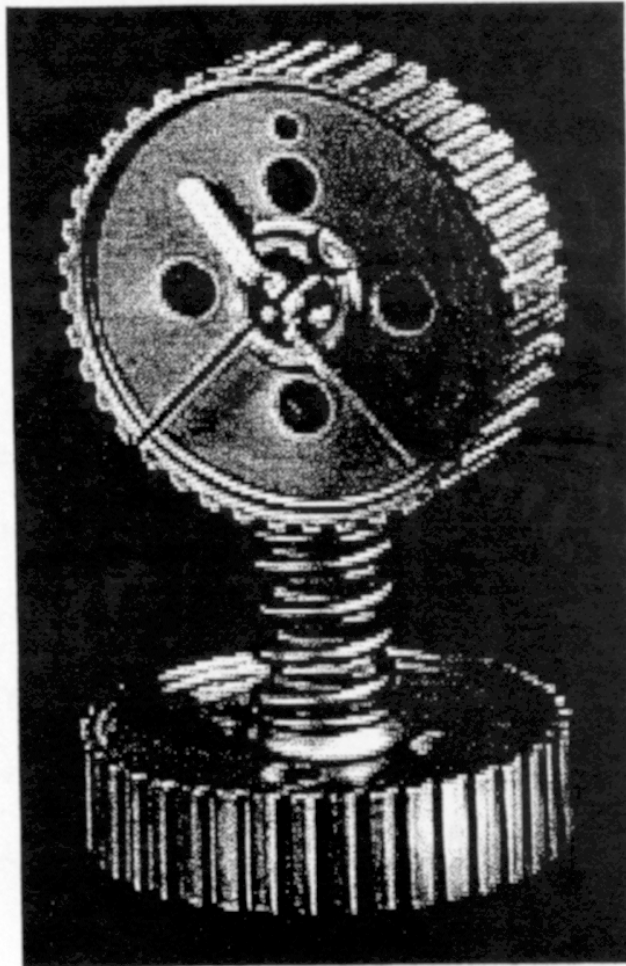
There is a plan of manufacture, indicating the processes to be involved in the production of the clock, and there is mention of the stages of quality control. There is limited evaluation and justification to each of these stages, however the references included do relate to 'real world' engineering processes and techniques.

### Points 7

## Total Points 23

# GCSE ENGINEERING

## Unit 1 Design Portfolio





## INTRODUCTION

This design project is required for part of my unit 1 portfolio for GCSE engineering. I am going to learn about the design process and quality control and how the design process links to production. I will also be looking at how to present my final design solution to the customer using manual and ICT based engineering drawing techniques. The customer will need to know how I plan to include quality control into the production of the clock.

## DESIGN BRIEF

Mr Steel, a local steel stockholder wishes to commission a small batch of table / desk clocks to issue to its favoured clients. The clock must be practical, stylish and eye catching, as the aim is to promote Mr steels' company. Cost will be an important factor as Mr Steel will not be selling the clocks but they must also not look cheap.

## MINUTES OF INITIAL MEETING

DATE: April 1<sup>st</sup> 2003

VENUE: Steel Room

ATTENDEES: Mr Steel, A. Designer

Mr Steel Wishes to promote company

Designer What is the preferred material, size and shape

Mr Steel Material - Metal preferably steel.

Size - Not bigger than 200mm square

Shape - Simple and stylish and eye catching

Designer Approximate cost?

Mr Steel Min £5 - Max £15

Designer What quantity is required?

Mr Steel Approximately 100 for first batch

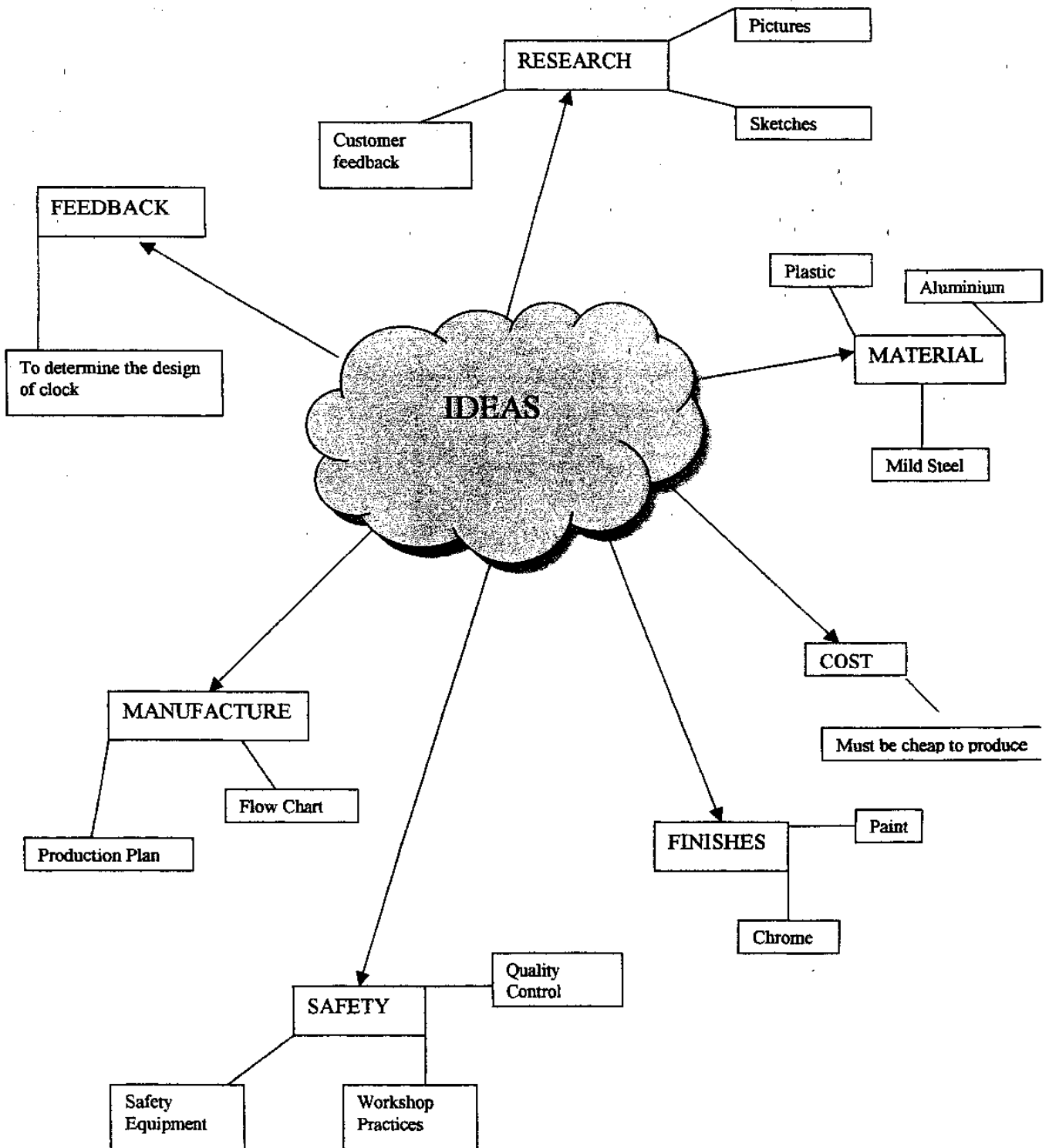
Designer What date are they required for?

Mr Steel No particular date, but as soon as possible

## Key points of meeting - The specification for 'The Clock'

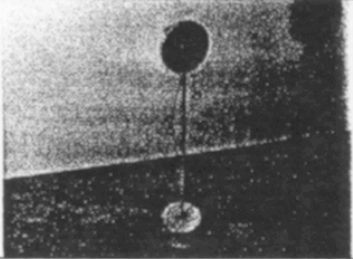
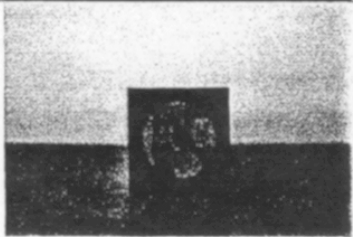
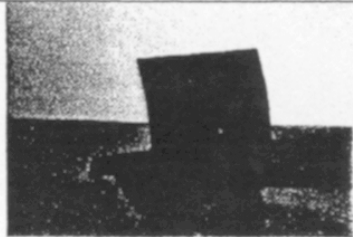
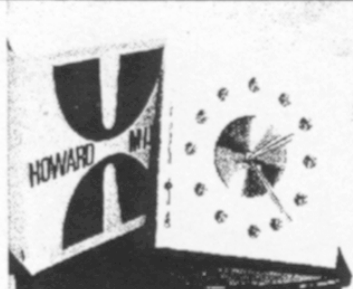
- The clock must be fabricated from metal.
- The clock face design is required to be simplistic and stylish.
- Maximum Size 200mm x 200mm.
- Clock mechanisms are to be bought in and must be appropriate to the size and style of the clock.
- The cost must be kept to a minimum as they are to be given away free of charge to the customer.
- The clock must be spray painted using a two colour finish.

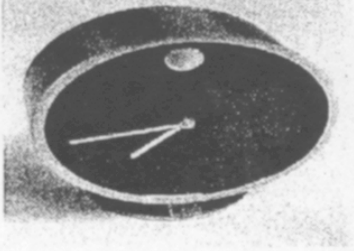
# BRAIN STORM



## RESEARCH

The following selection shows several clock designs, which could be developed.

Design	Suggestion	Stockholder Feedback
	<p>This style of clock could be suitable for a modern office. It is simplistic and eye catching</p>	<p>A little bit too contemporary for some of our clients</p>
	<p>This style could be deemed suitable for an office clock. It is has a small, compact, neat and very simple style.</p>	<p>It is a bit too small and plain and may get lost amid papers on a desk. Although there is room for development.</p>
	<p>This style of clock is small, simple and eye catching.</p>	<p>This one is very interesting but does not look very stable. But could possibly be developed further.</p>
	<p>This style of clock is also small, simple and eye catching.</p>	<p>This one looks a bit too ornamental for an office.</p>

	<p>This is a slightly different style, more flowing and curvy</p>	<p>This shape is very interesting, but again it does not look very stable. But could possibly be developed further.</p>
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## RESEARCH FINDINGS

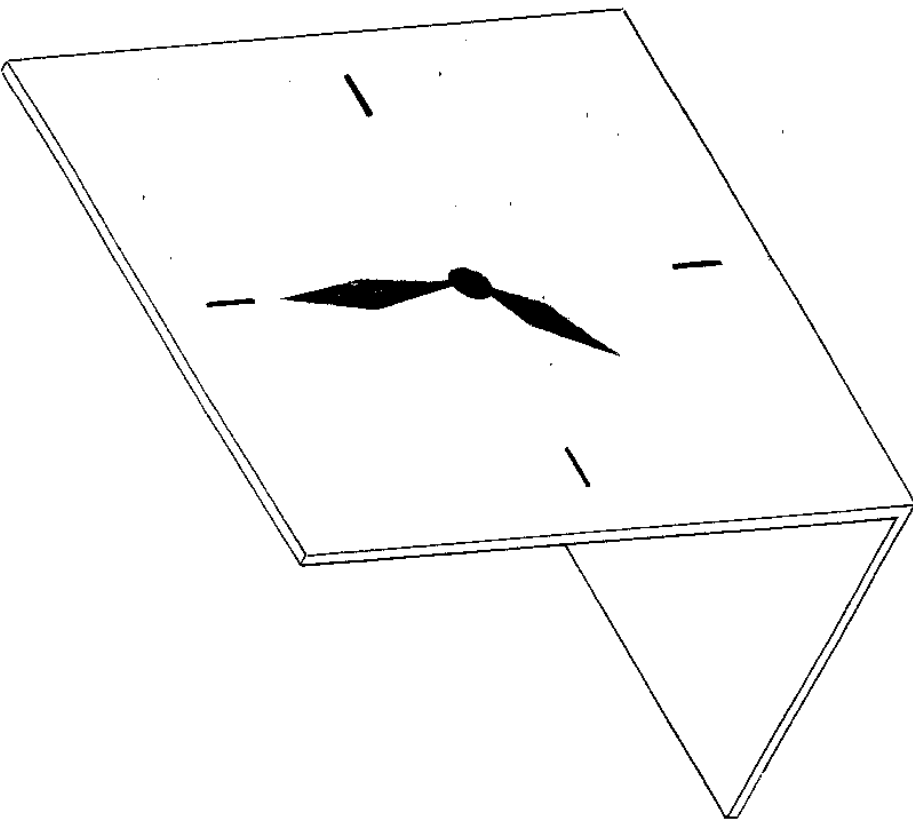
From the research findings and feed back from Mr Steel the design of the clock will be small, simple and contain both straight and curved edges.

The following design drawings were developed from Mr Steels feedback.

Design idea 3 was given to Mr Steel as the final design for approval, as this design contained all the criteria that that Mr Steel requested.

The next four pages have been reduced from A3 sheets,  
which were hand drawn using pencil.

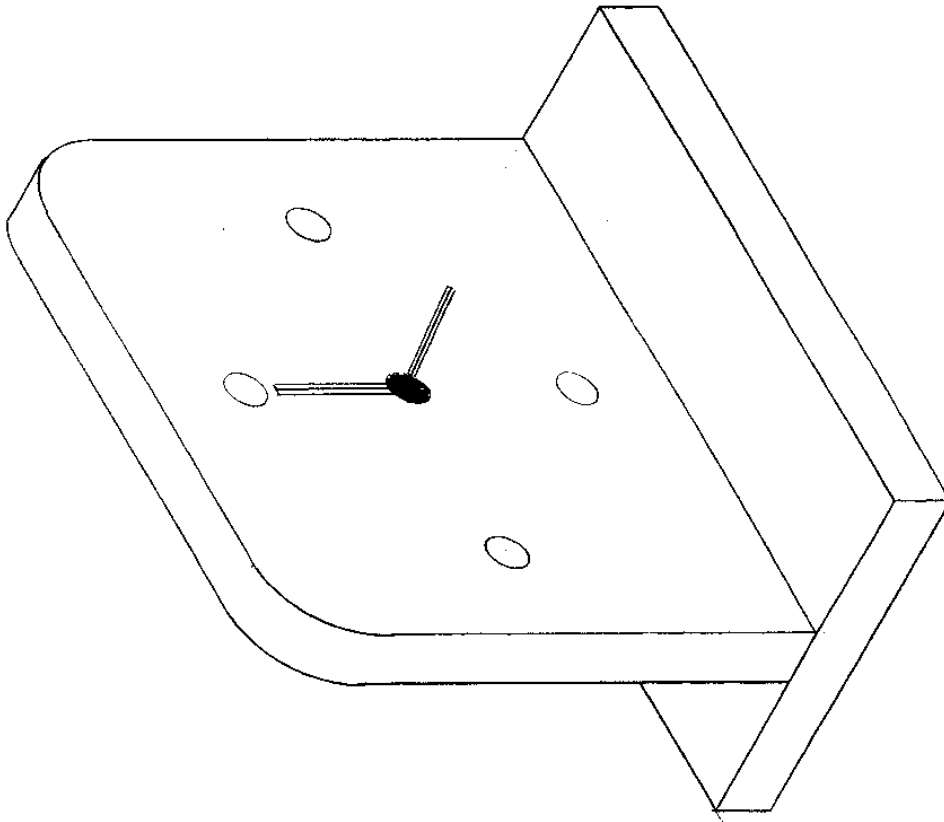




MY FIRST DESIGN IS  
 VERY SIMPLE TO  
 MANUFACTURE. IT ALSO  
 MEETS THE DESIGN BRIEF.  
 HOWEVER I FEEL THE  
 CORNERS ARE TOO SHARP  
 AND NEED TO BE MORE  
 ROUNDED OFF.

NAME	DATE	PROJECTION	TITLE
UNITS IN MM	SCALE 1:1	ISOMETRIC	DESIGN.IDEA 1

FOR DESIGN 2 I HAVE  
 WELDED TWO PLATES  
 TOGETHER. I HAVE  
 ALSO DRILLED FOUR  
 HOLES TO ACT AS  
 NUMBERS. I THINK  
 THAT THIS DESIGN  
 NEEDS MORE DETAIL



NAME

DATE

PROJECTION

TITLE

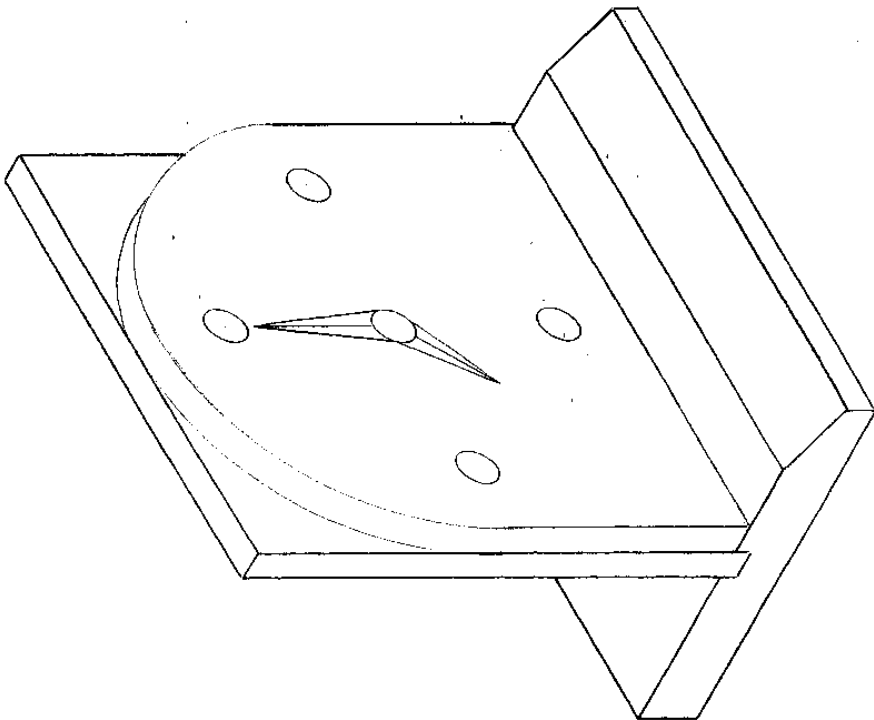
UNITS IN MM

SCALE 1:1

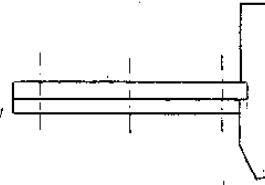
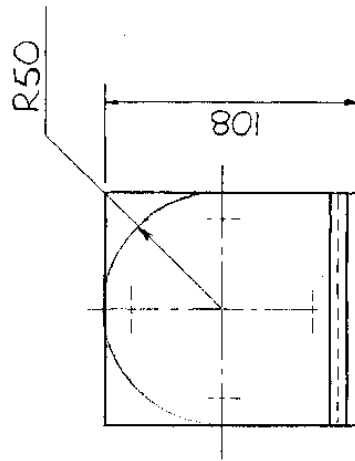
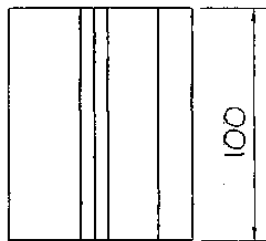
ISOMETRIC

DESIGN IDEA 2

I WILL CHOSE DESIGN 3 FOR MY FINAL DESIGN. IT COVERS MORE PROCESSES THAN THE OTHER TWO AND I AM PLEASED WITH THE SHAPE



NAME	DATE	PROJECTION	TITLE
UNITS IN MM	SCALE 1:1	ISOMETRIC	DESIGN IDEA 3



NAME

UNITS IN MM

DATE

SCALE 1:2

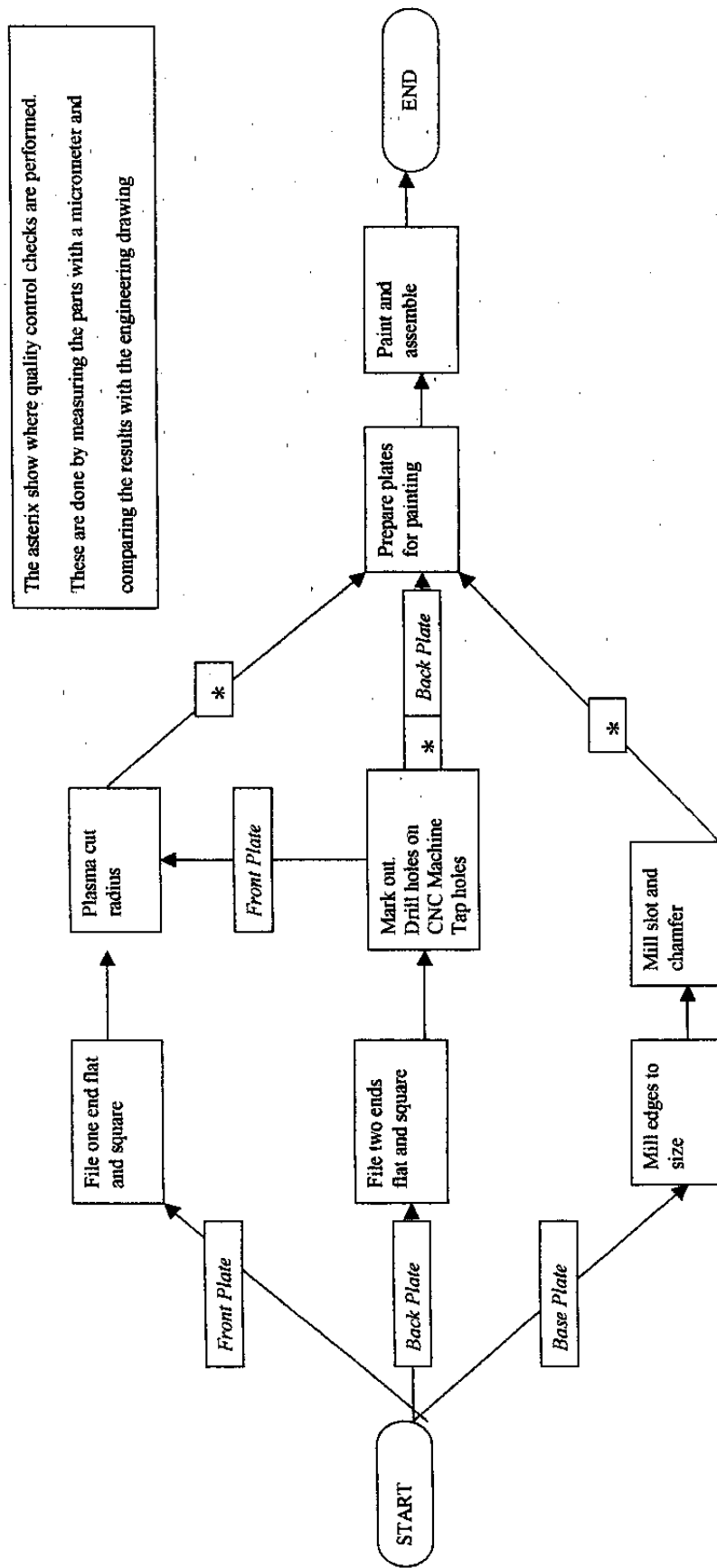


THIRD ANGLE  
PROJECTION

TITLE

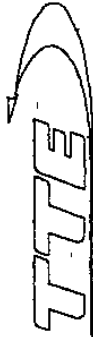
FINAL DESIGN

## PLAN OF MANUFACTURE (FLOW CHART)



12

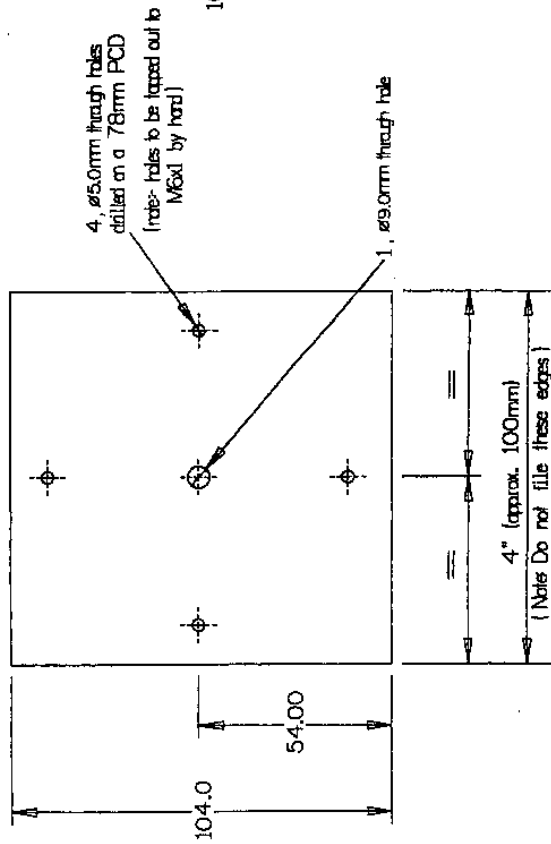
# CLOCK FRONT & BACK PLATES



IF IN DOUBT ASK

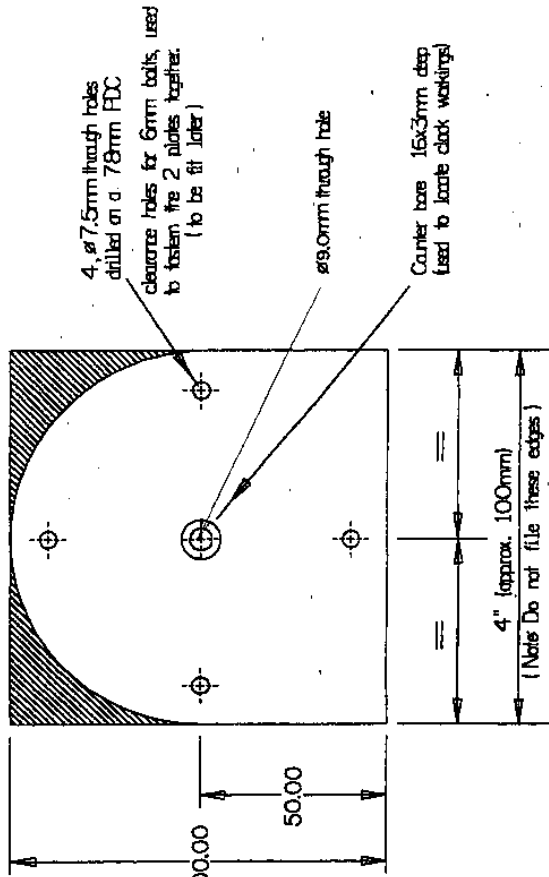
DO NOT SCALE

CNC Programming for the machining of the Back Plate  
(Slots into base)



Material - Mild Steel (bright bar)  
Raw material - front face - 114 x 101.6 x 6.35 thick  
Raw material - back plate - 108 x 101.6 x 6.35 thick

CNC Programming for the machining of the Front Plate

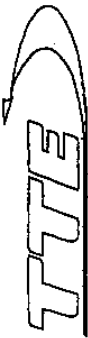


REMOVE ALL SHARP EDGES

ALL MEASUREMENTS IN mm

# SCHOOLS MECHANICAL PROJECT 2002

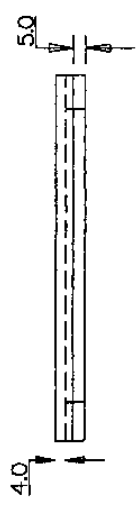
Drawn and developed by D.Fairlie/S.Harrison



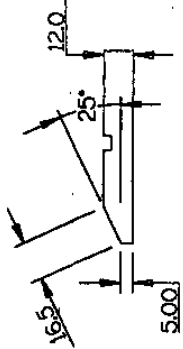
# CLOCK BASE

IF IN DOUBT ASK

DO NOT SCALE

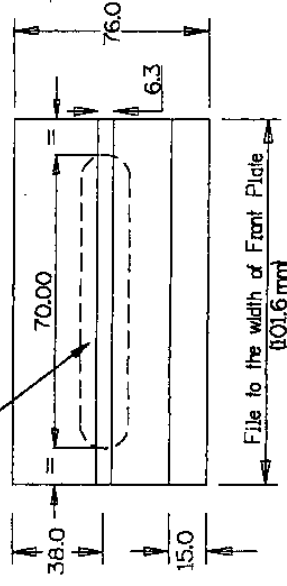


FRONT VIEW

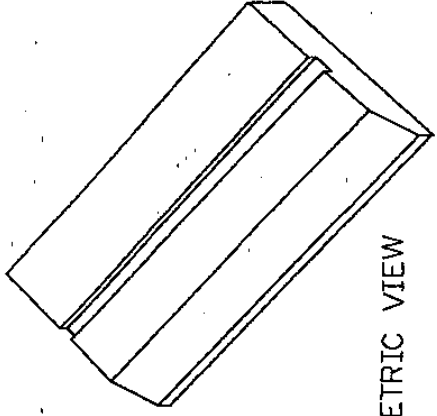


SIDE VIEW

Slotted keyway 20wide x 70long x 8deep  
Machined to under side of Base in line  
with the smaller slot in top face



PLAN VIEW



ISO METRIC VIEW

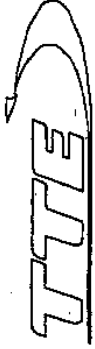
Material - Mild Steel (bright bar)  
Raw material size - 75x12x103mm long

REMOVE ALL SHARP EDGES

ALL MEASUREMENTS IN mm

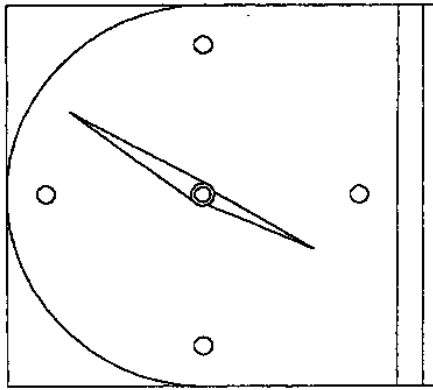
# SCHOOLS MECHANICAL PROJECT 2002

Drawn and developed by D.Pantleth/S.Hazlton

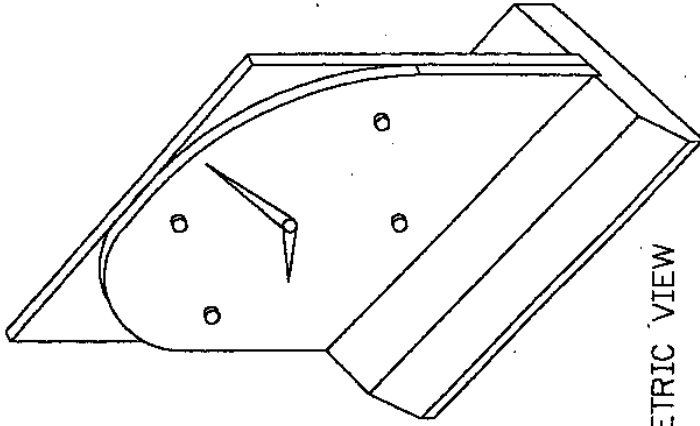


TWO VIEWS OF THE COMPLETED CLOCK

IF IN DOUBT ASK



FRONT VIEW



ISO METRIC VIEW

REMOVE ALL SHARP EDGES

Material - Mild Steel (bright bar)

ALL MEASUREMENTS IN mm

SCHOOLS MECHANICAL PROJECT 2002

Drawn and developed by DParfitt/S.Hartman



## EVALUATION

Design 3 was chosen for the final design of the clock because it satisfied the specification criteria and Mr Steels own personal preference.

It is important to use the correct engineering processes, safety procedures and quality control during the manufacture of the clock. The edges of all three plates are de-burred and filed to remove any sharp edges. The edges of the base plate are milled to size and the slot is also created by the milling machine, using a slot drill. The holes in the front and back plate are created on the CNC machine, which ensures that they are always drilled in the same place. Quality checks are performed at vital stages of the manufacturing process to ensure that prior to assembly, the parts of the clock are the correct size, the holes are in the correct place and that the clock fits together correctly.