DET

Graphic Communication

Technical Graphics

(Advanced Higher)

7070

June 2000

HIGHER STILL

DET

Graphic Communication

Technical Graphics

(Advanced Higher)

Support Materials

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Higher Still Development Unit
PO Box 12754
Ladywell House
Ladywell Road
Edinburgh
EH12 7YH

TEACHER/LECTURER GUIDE

The support materials provided on disc are organised into 6 folders:

- Covers
- Oblique Cones
- Conic Sections
- Transitions
- Intersection
- Measured Perspective.

Within the Covers folder are the front sheets for the sections Oblique cones through to Measured Perspective. These sheets were produced in Word 2000.

In each of the other folders Oblique Cones through to Measured Perspective are the drawings for the unit Technical Graphics. All the drawings were produced in AutoCAD LT98.

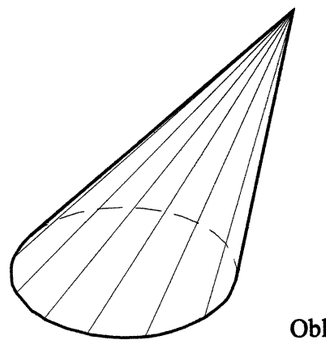
Please note that these support materials do not constitute a course. To allow for flexibility and personal input the questions are not numbered and each section is not dependent upon the other.

When teaching time and assessment are, however, taken into consideration the number of drawings within these support materials may well provide a satisfactory balance for a unit that has an approximate 20-hour allocation of time.

Technical Graphics Support Material

Advanced Higher Graphic Communication

OBLIQUE CONES



Oblique Cone

Oblique Cones

An oblique cone is unlike a right cone. The base is circular but the apex is not directly above the centre of its base.

Construction of Surface Development of an Oblique Cone.

1. Draw the elevation and the half plan;

2. Line in the generators numbering them in order as shown;

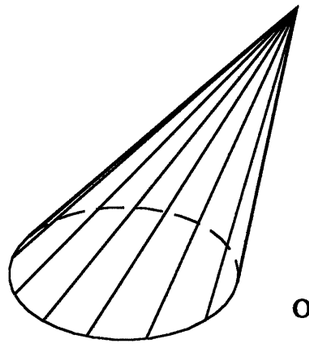
The development is made up from a series of triangles drawn in order.

3. Draw line AO_1, using A as the centre and $A1_1$ as the radius strike an arc in 1_1;

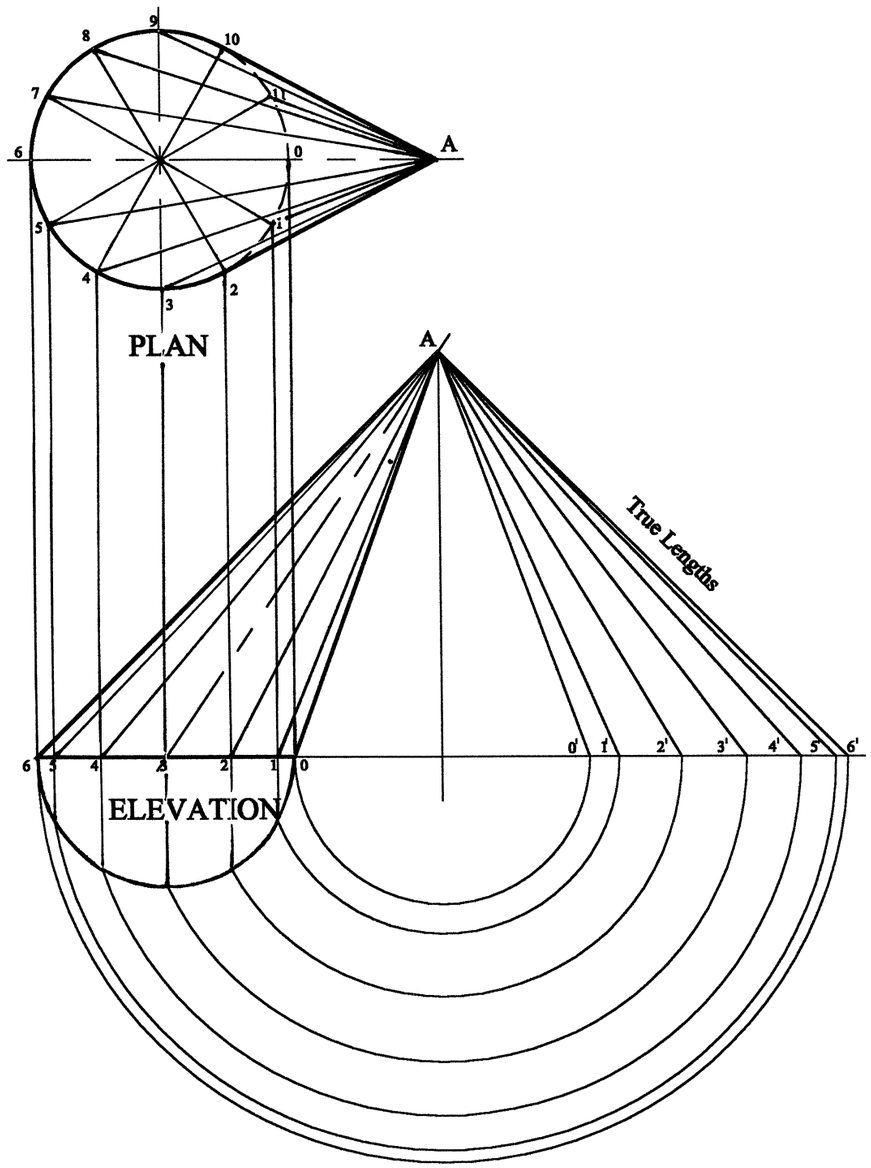
4. Using O_1 as centre and O1 from the plan strike a second arc in 1_1;

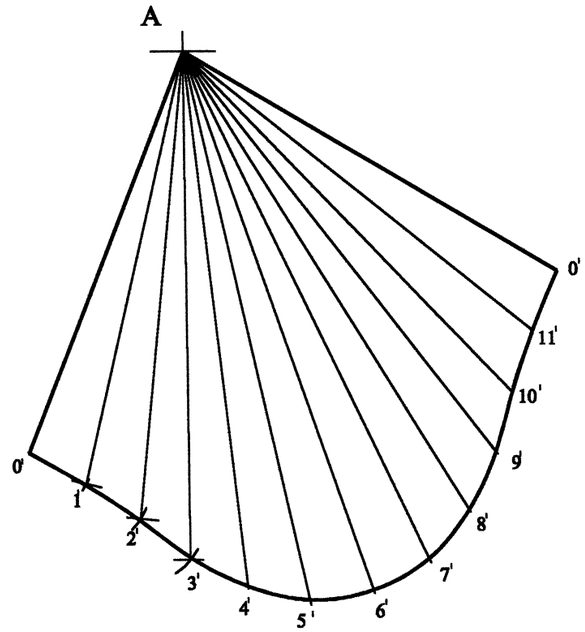
5. Repeat the procedure in 3 and 4 with all the true length lines in the elevation and lengths of arc from the half plan;

6. Finally join all the intersecting points with a smooth curve.



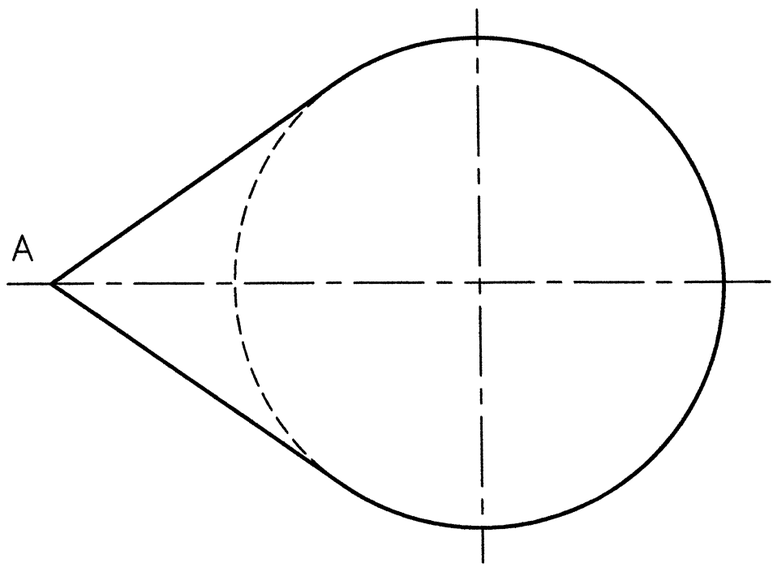
Oblique Cone

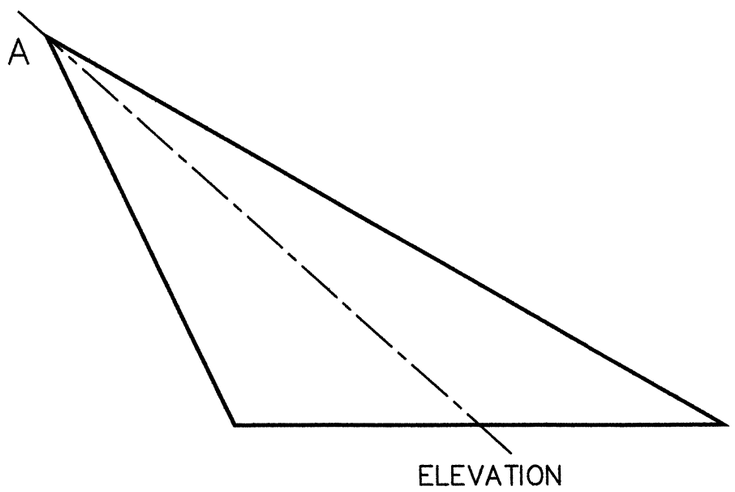




Surface Development

The elevation and plan of an oblique cone are shown .
Draw full size the surface development of the cone in the position indicated.

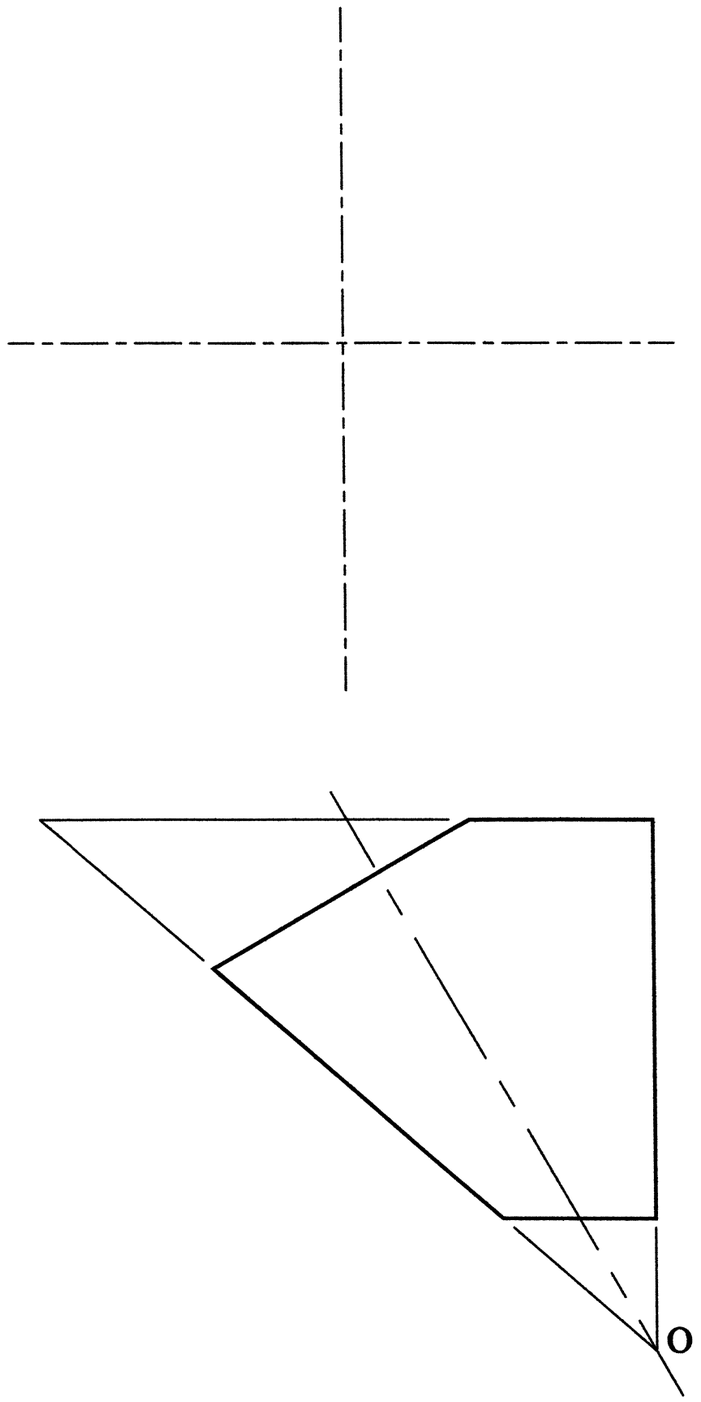


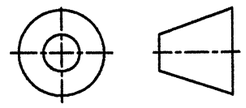


A

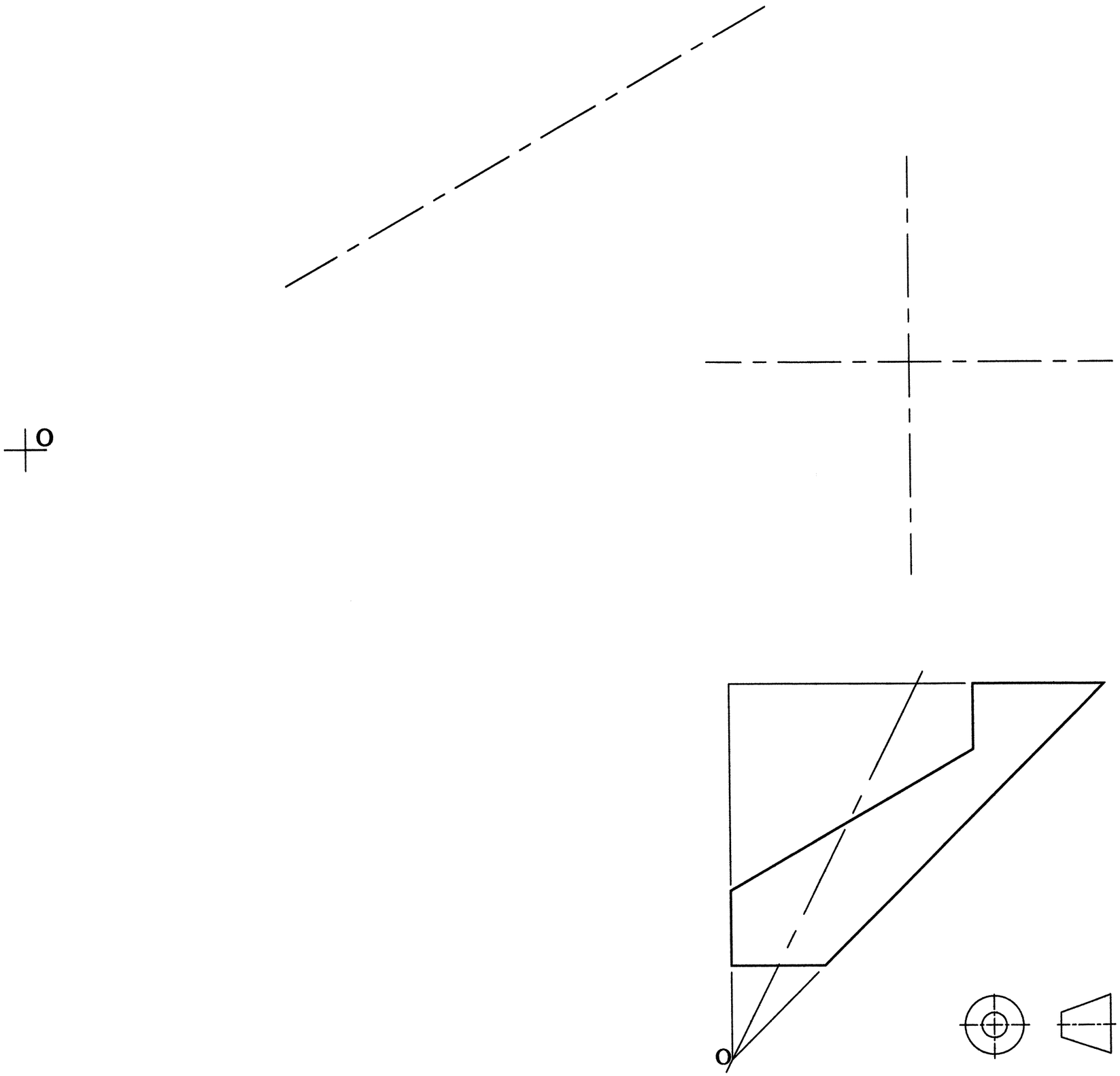
The elevation of a hollow truncated oblique cone is shown .
Draw full size:
(a) the plan;

(b) the surface development of the cone in the position indicated.

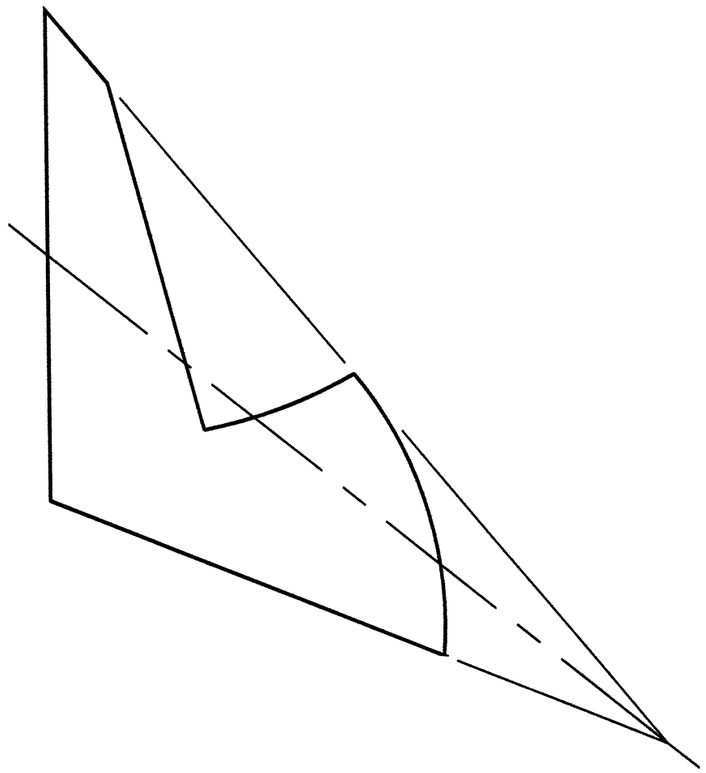




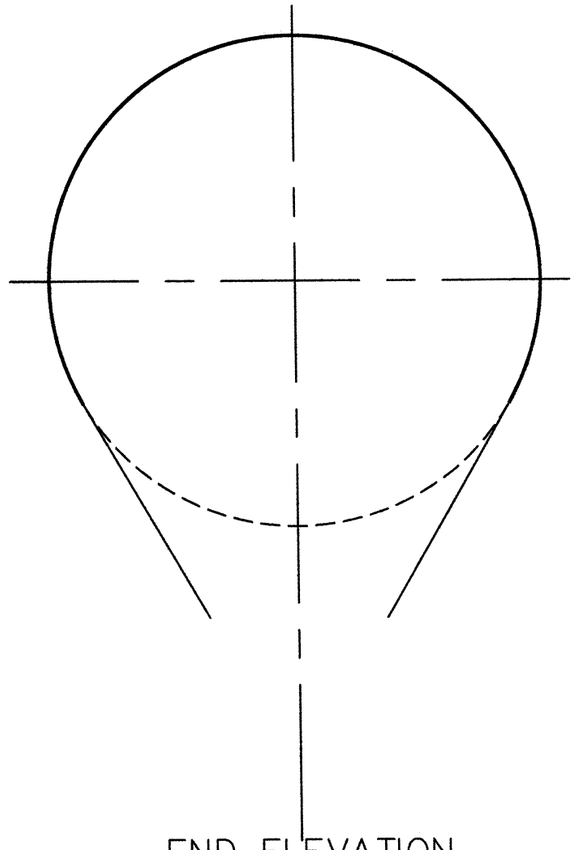
The elevation of a ventilating duct is shown. The duct is made from sheet steel and is fabricated around an oblique cone.
Draw full size:
(a) the plan;
(b) an end elevation;
(c) the surface development of a symmetrical half of the cone;
(d) the auxiliary plan to show the true shape of the angled surface.



The elevation and incomplete end elevation of part of an oblique cone are shown . The cone is hollow.
Draw full size:
(a) the complete end elevation;
(b) the surface development of the cone in the position indicated.

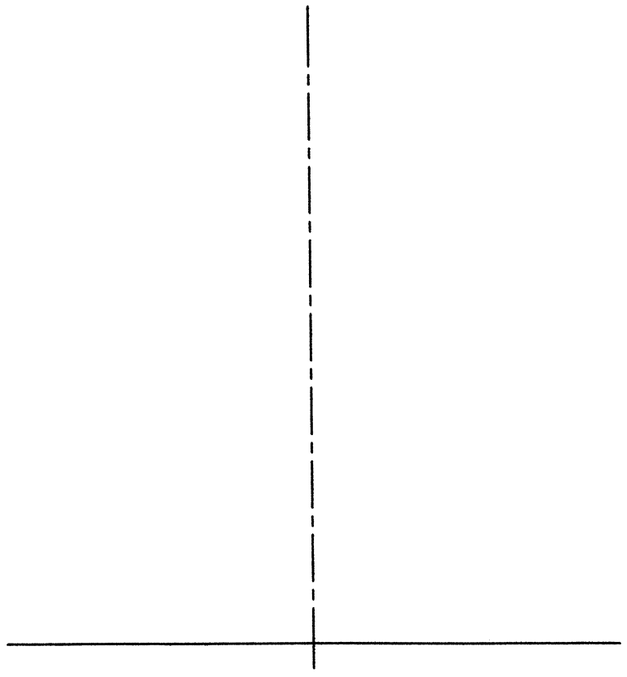


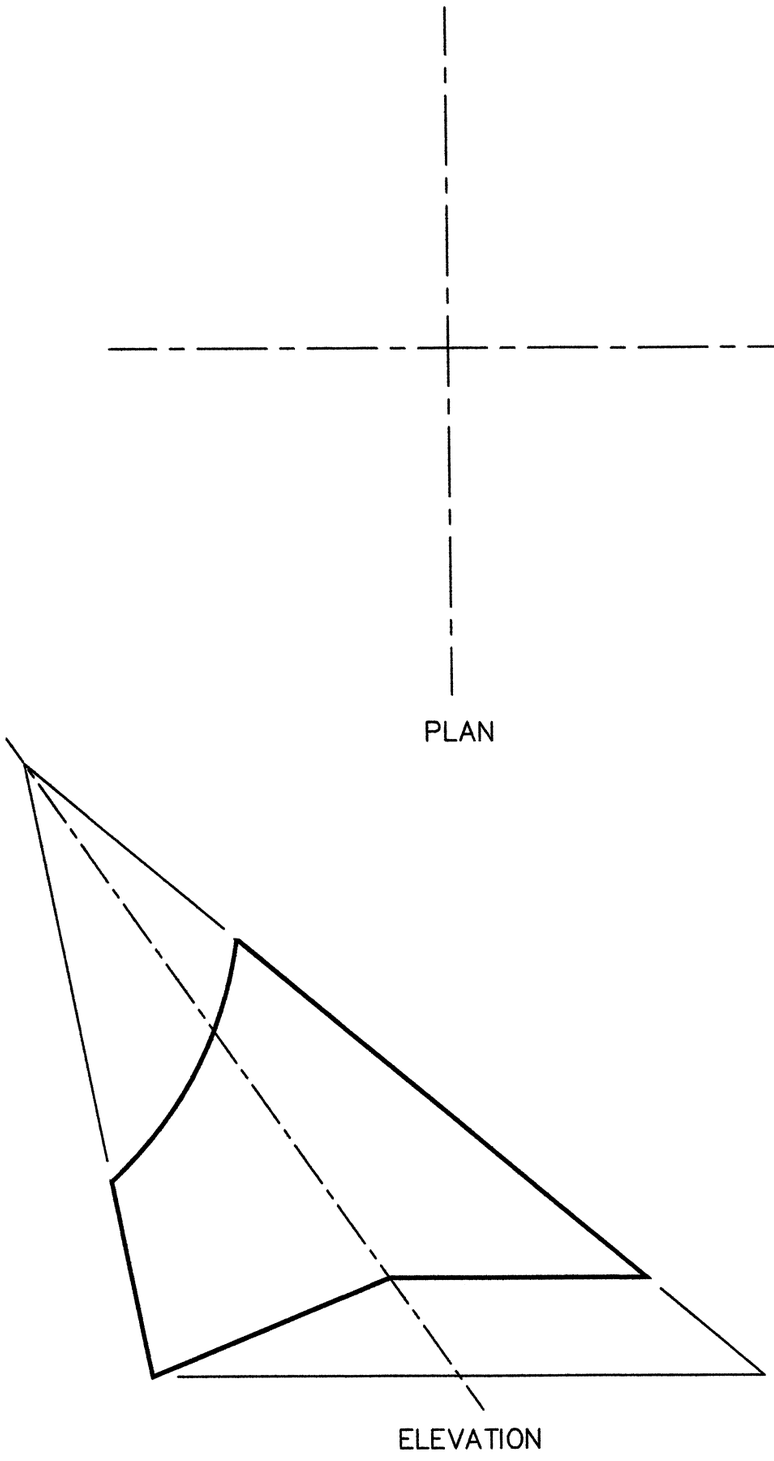
ELEVATION

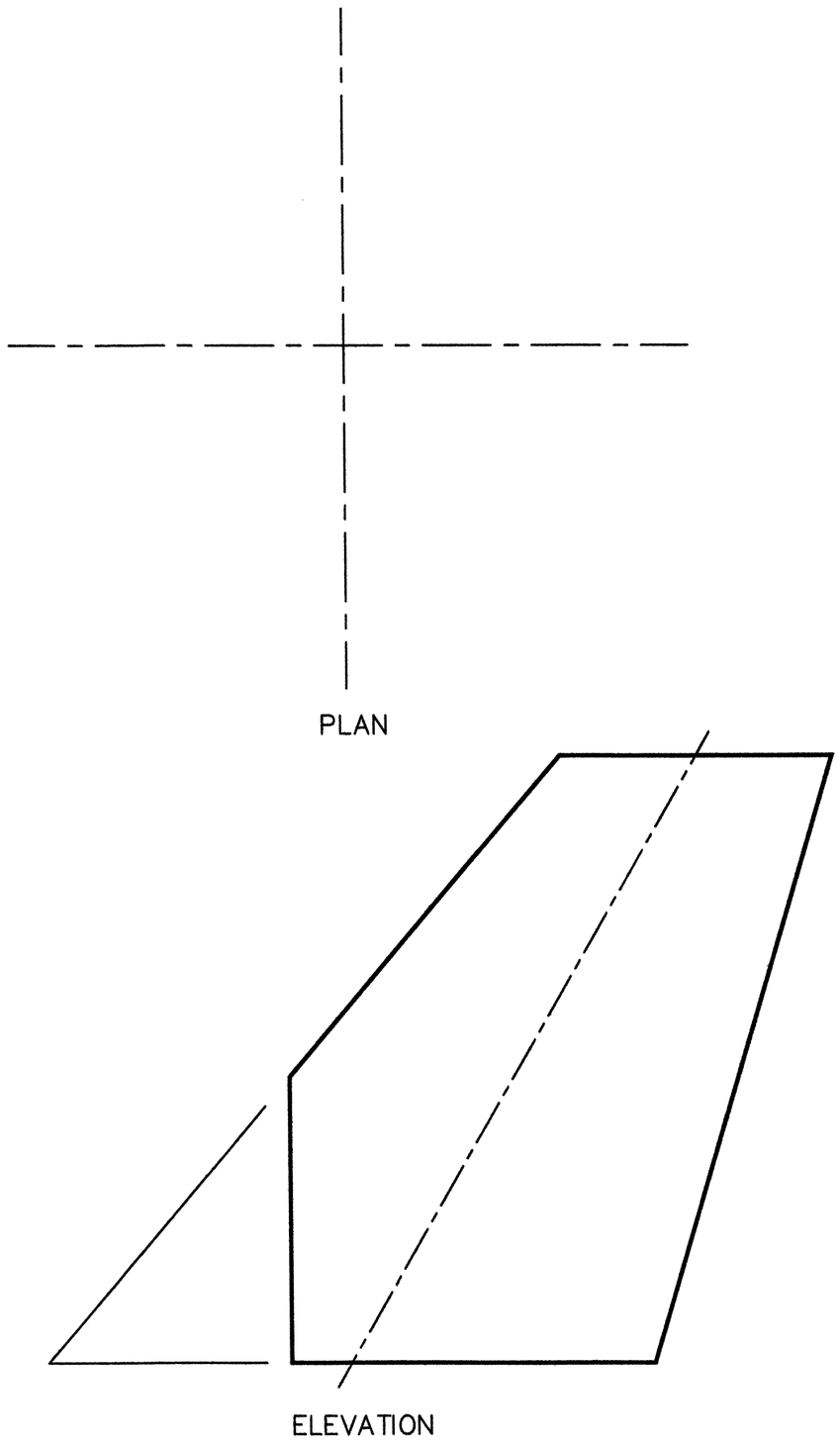


END ELEVATION

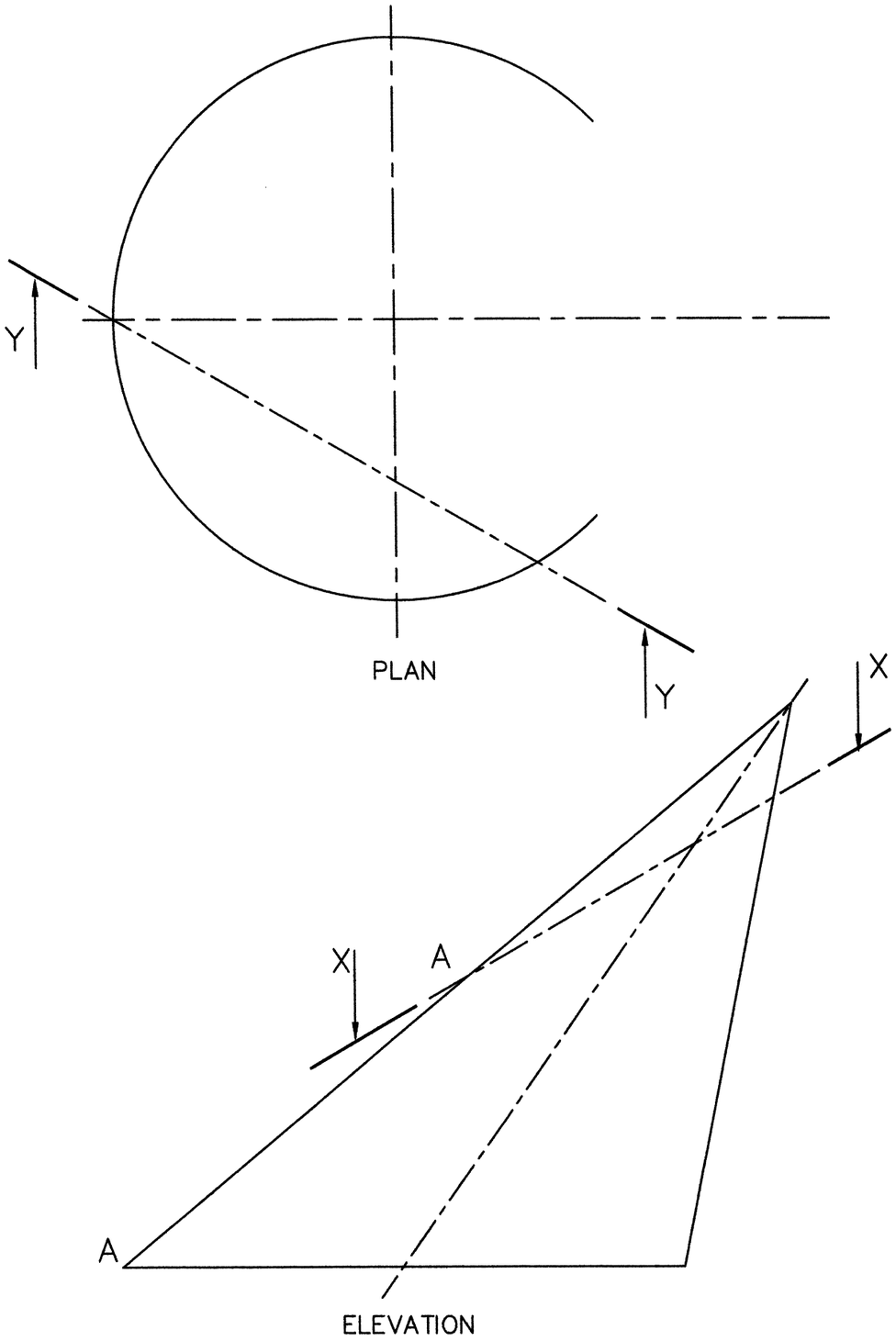
A transition piece for part of a ventilating duct, that is part of an oblique cone is shown in elevation.
Draw, full size
(a) the plan;
(b) the end elevation;
(c) the development of the duct.





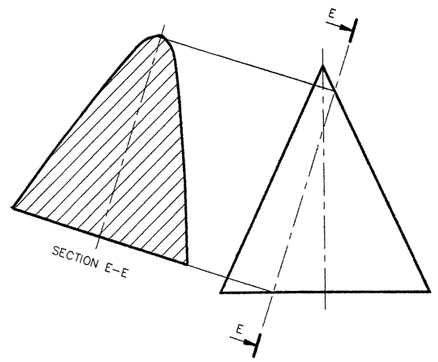


A ships funnel is in the form of an oblique cone is shown in elevation.
Draw, full size
(a) the plan;
(b) a symmetrical half surface development.



A hollow oblique cone is cut by two planes, X-X and Y-Y, as shown in the two incomplete views.
(a) Complete the elevation, as a section on Y-Y;
(b) Complete the plan, as a section on X-X;
(c) Draw the development of the curved surface of the cut cone, with the seam on A-A.

CONIC SECTIONS



Conic Sections

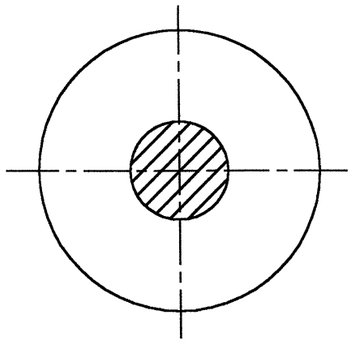
When a right circular cone is cut by a plane of intersection the cut surface resulting from the intersection is called a conic section.

There are five sections obtainable from a cone: the circle, the triangle, the ellipse, the parabola and the hyperbola. The resulting section is dependent on the relationship of the cutting plane to the slanting surface of the cone.

The ellipse, the parabola and the hyperbola are use widely in design and engineering applications. The ellipse is used frequently in design because of its pleasing shape. Structures based upon the parabola and hyperbola are able to withstand very high loads and are used effectively in civil engineering projects.

Section A-A

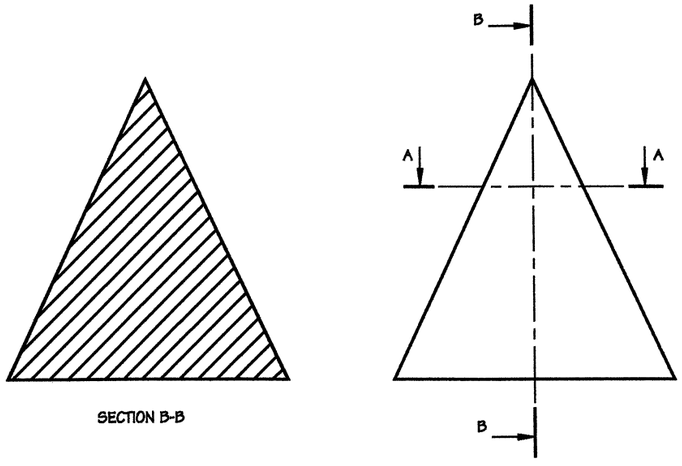
This is a horizontal cutting plane, it produces a **circle** in the plan.



SECTION A-A

Section B-B

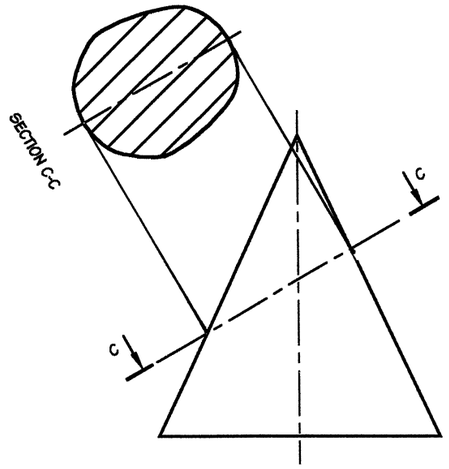
When the cutting plane passes through the apex of a cone the resulting section in the end elevation is **triangular**.

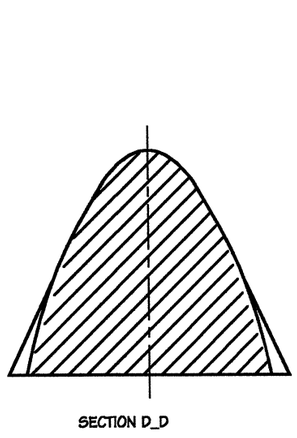


SECTION B-B

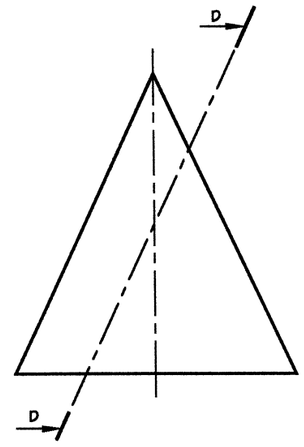
Section C-C

When the cutting plane cuts a cone at an angle that is less acute than the sloping side of the cone the resulting section is an **ellipse**, in the plan and the end elevation.



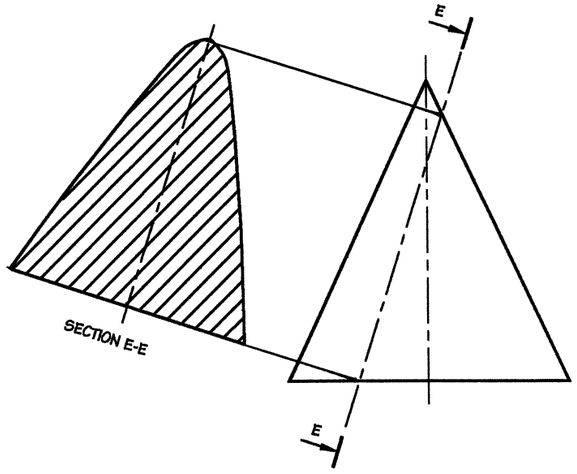


SECTION D_D



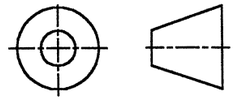
Section D-D

When the cutting plane is parallel to the sloping side of a cone the resulting section is a **parabola.**

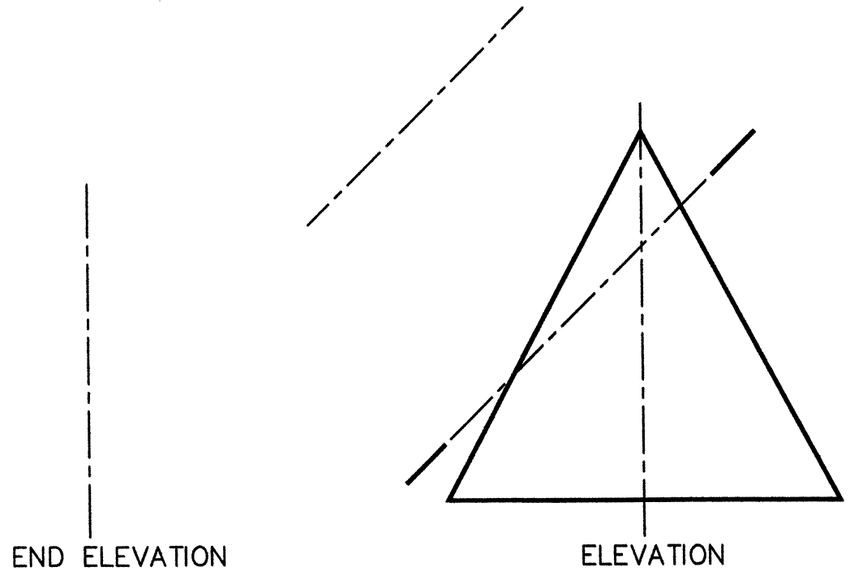


Section E-E

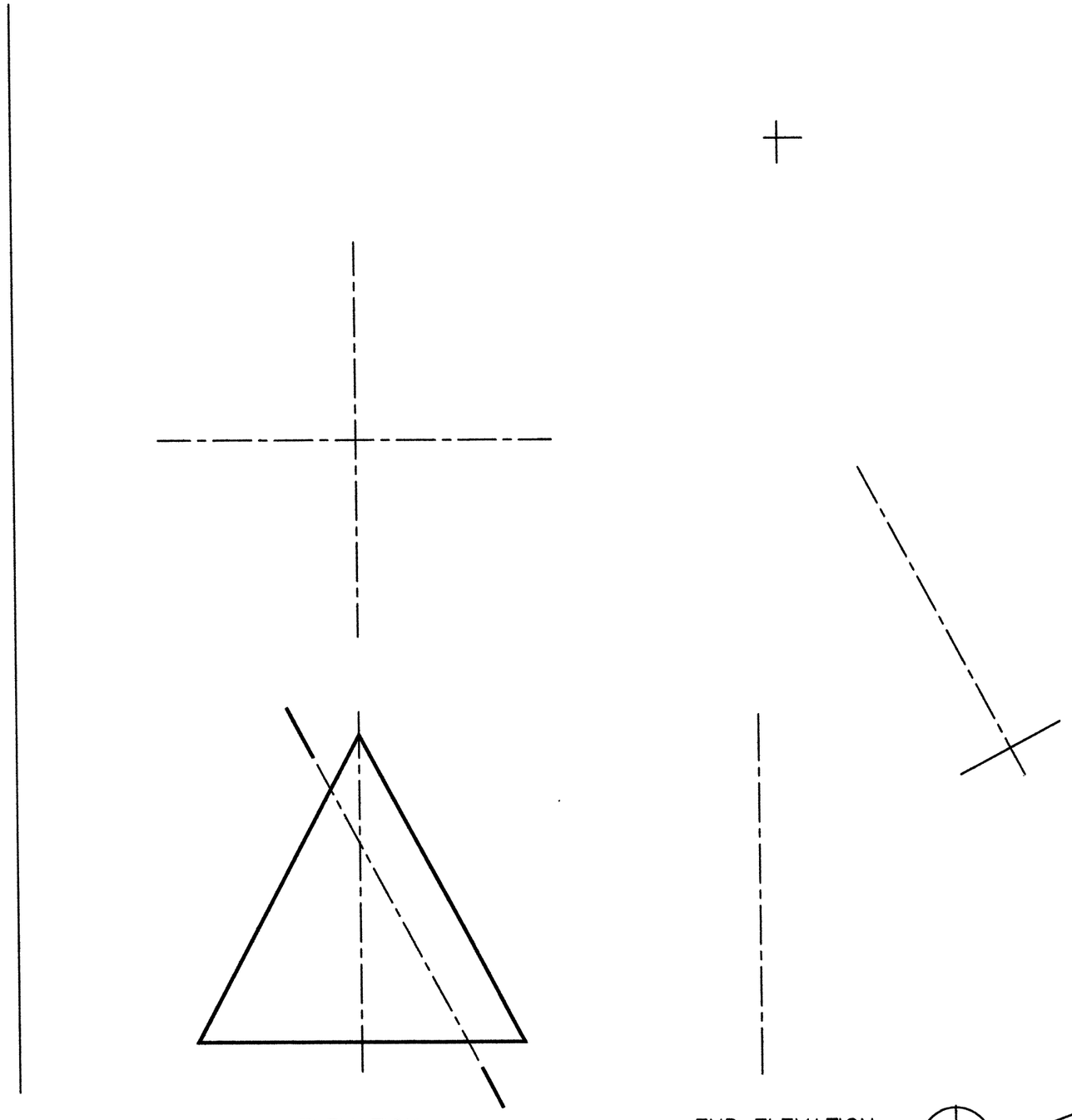
When a cutting plane cuts a cone at an angle that is more acute than the sloping side of the cone the resulting section is a **hyperbola.**



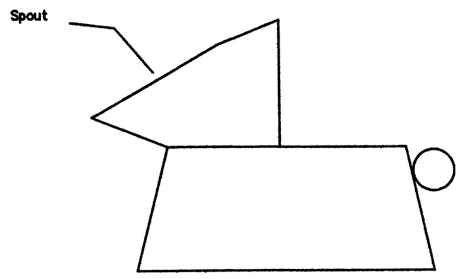
A cone cut by a cutting plane is shown in elevation.
Draw:
(a) the sectional end elevation in the position indicated;
(b) the true shape of the cut surface;
(c) a symmetrical half surface development of the cone with the section removed.



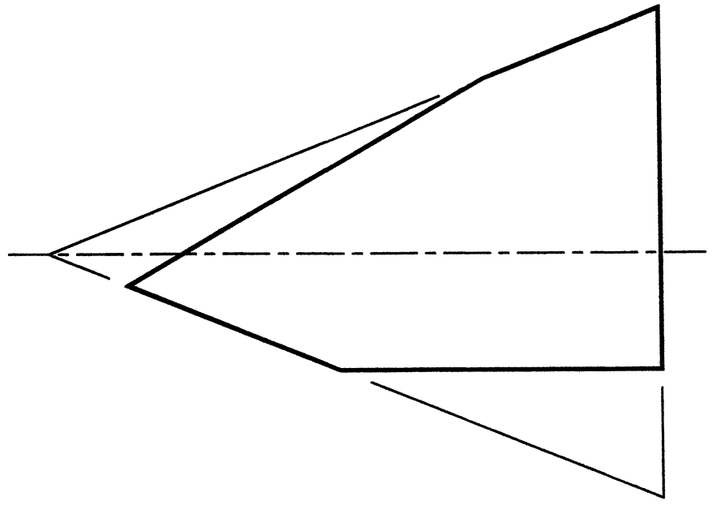
A cone cut by a cutting plane is shown in elevation.
Draw:
(a) the sectional plan;
(b) the sectional end elevation in the position indicated;
(d) the true shape of the cut surface;
(e) the surface development of the sectioned cone.



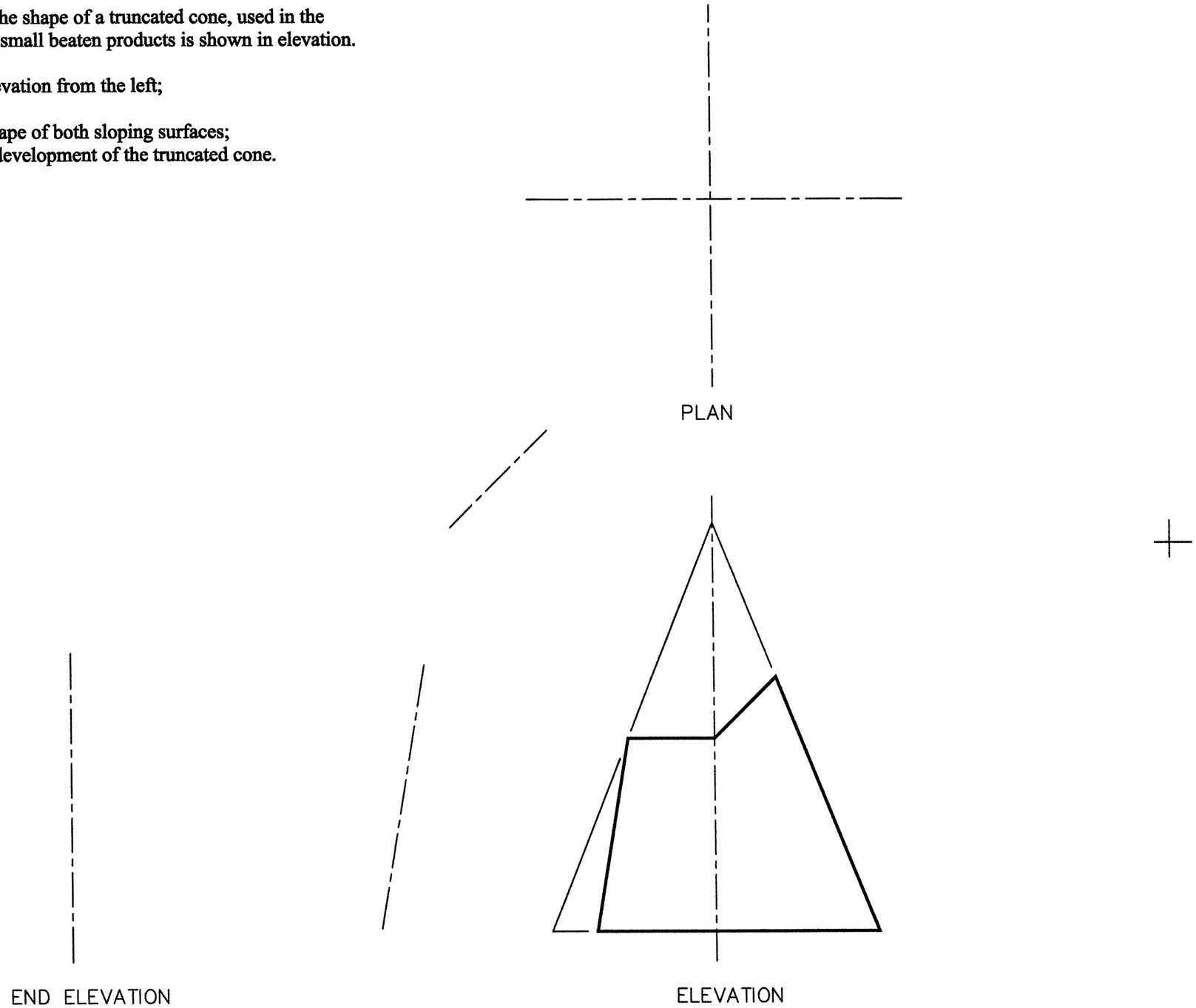
An outline of a small watering can is shown. The spout is shaped from a right cone and the elevation of spout is given.
Draw:
(a) the end elevation from the left;
(b) the true shape of the pouring hole;
(c) the surface development of the spout.



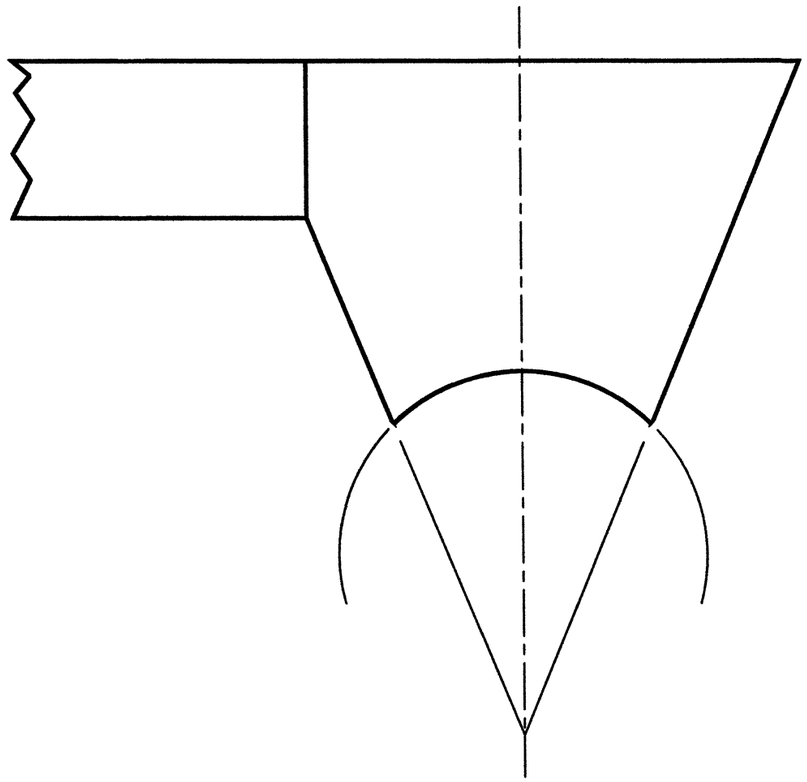
Outline of watering can



A pattern, in the shape of a truncated cone, used in the fabrication of small beaten products is shown in elevation.
Draw
(a) the end elevation from the left;
(b) the plan;
(c) the true shape of both sloping surfaces;
(d) a surface development of the truncated cone.

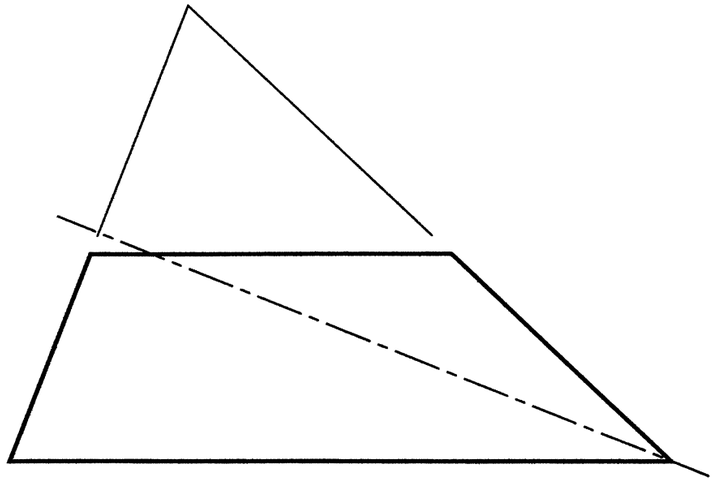


A conical hopper feeds plastic granules to a cylindrical pipe. The granules are fed into the hopper via a specially made adapter pipe. The hopper is shown in elevation.
Draw:
(a) the surface development of the hopper;
(b) the profile of the adaptor pipe.

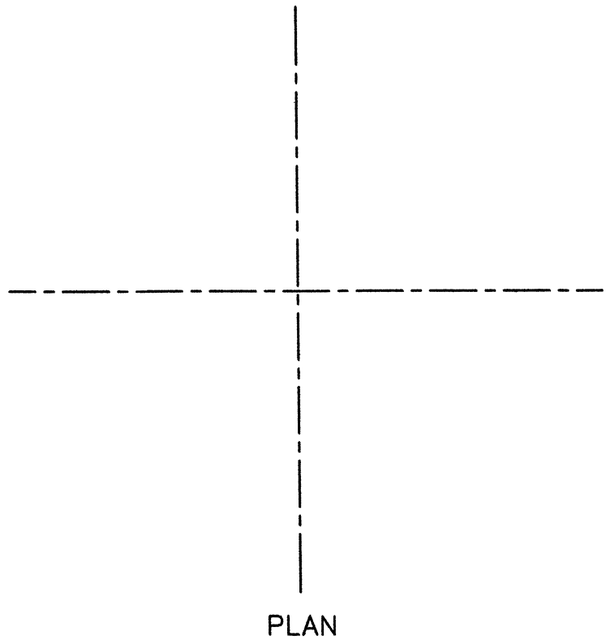


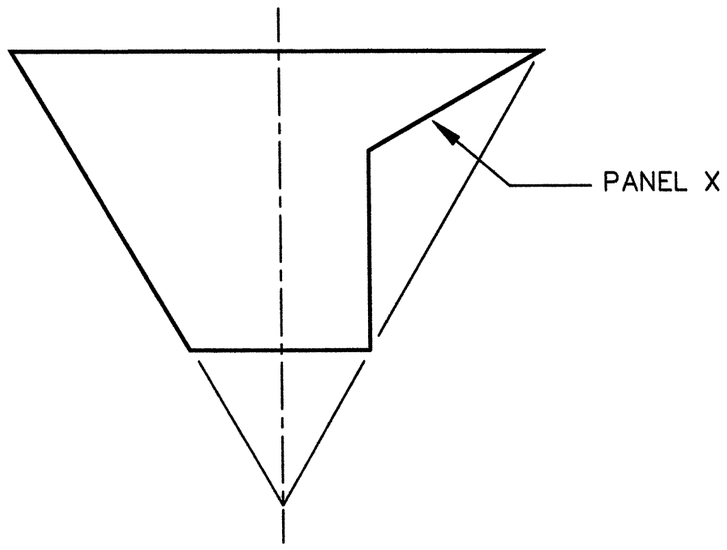
ELEVATION

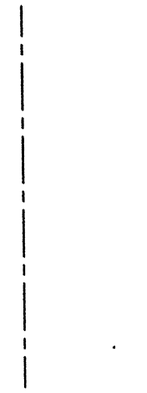
A truncated cone is shown in elevation.
Draw:
(a) the plan;
(b) a surface development of the truncated cone.



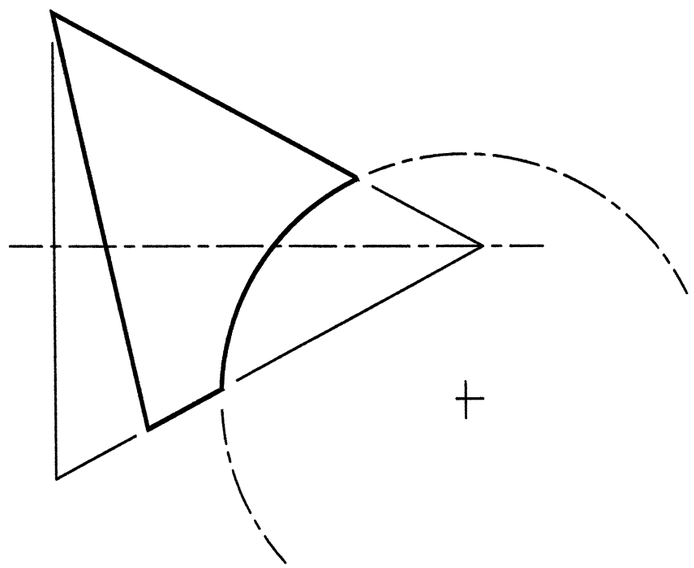
Part of a conical funnel piece shown below has two panels in its side that enable it to fit over a hexagonal projection.
Draw:
(a) the plan;
(b) the end elevation in the position shown;
(c) the true shape of panel X;
(d) a surface development of the funnel piece.





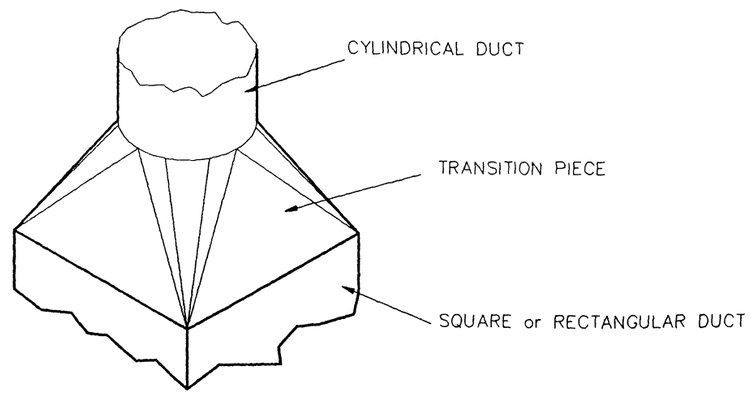


A protective shield that has to fit onto a circular pipe, shown in the elevation, has to be replaced. It is to be fabricated from sheet metal.
Draw the surface development of the shield.



ELEVATION

TRANSITIONS



Transition Pieces

Pipes and ducting that are used in the movement of powdered solids, (grain, plastics), gases and liquids often require dissimilar sections to be joined together. For this to happen efficiently these pipes and ducting are joined together with a transition piece.
This transition piece has to be carefully manufactured so as to fit both sections, e.g. cylindrical duct to a rectangular duct. In order for this to be done, an accurate surface development has to be made before fabrication.

Construction of Surface Development

The surface being developed, on the plan, is divided into four triangles, each with its base on the square, (or rectangle), and its apex on the circle, and twelve partial oblique cones each having its base on the circle and its apex in the corners of the square.
The development of the triangles and partial oblique cones drawn in order will produce the surface development of the transition piece.

1. Divide the circle on the plan into 12 equal parts;

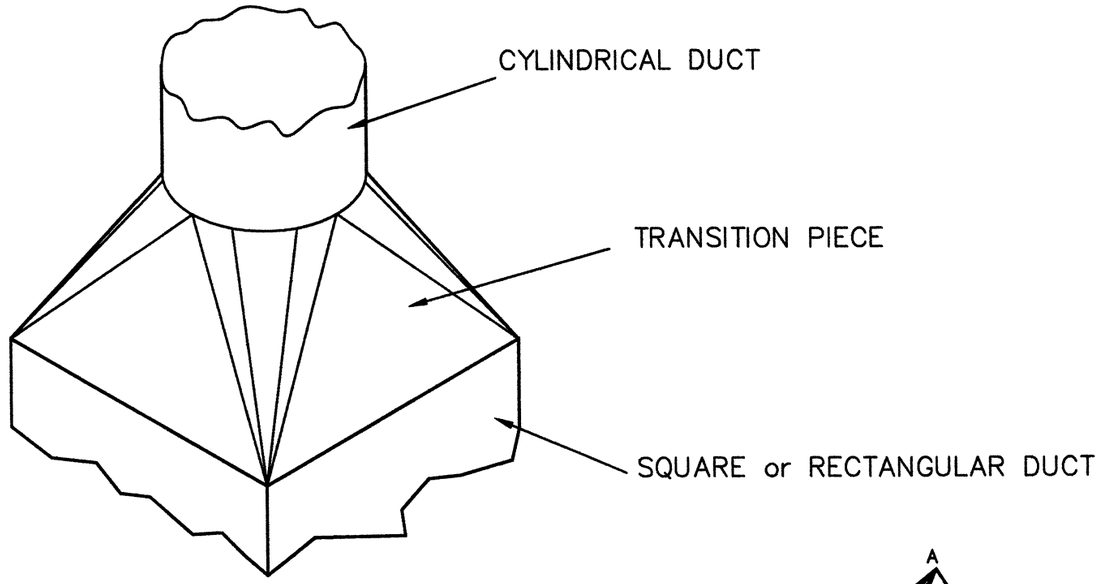
2. Join each point on the circle, as shown in the plan, to the corners of the square;

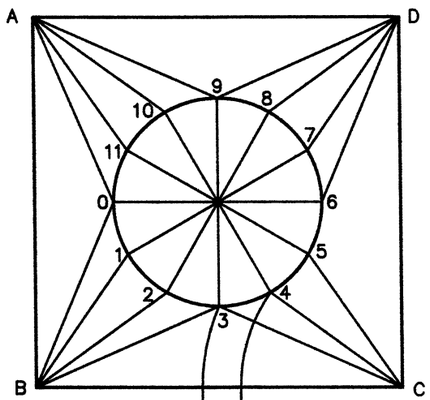
3. Construct the true length of each generator by rabattment. In this example the surface is symmetrical therefore only 2 generators need rebatting in order to find the true lengths;

4. True lengths of the base lines AB, BC, CD, DA and the chordal lengths 0 to 11 are taken directly from the plan.

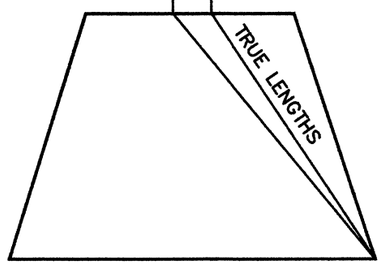
5. Each base section is linked by the true lengths of the oblique lines taken in order as shown. This is done by striking an arc using the true length of a generator, then striking an arc using the chordal length. The generator is fixed by the intersection of both arcs.

6. Join the intrsecting points, as shown, by a smooth curve.

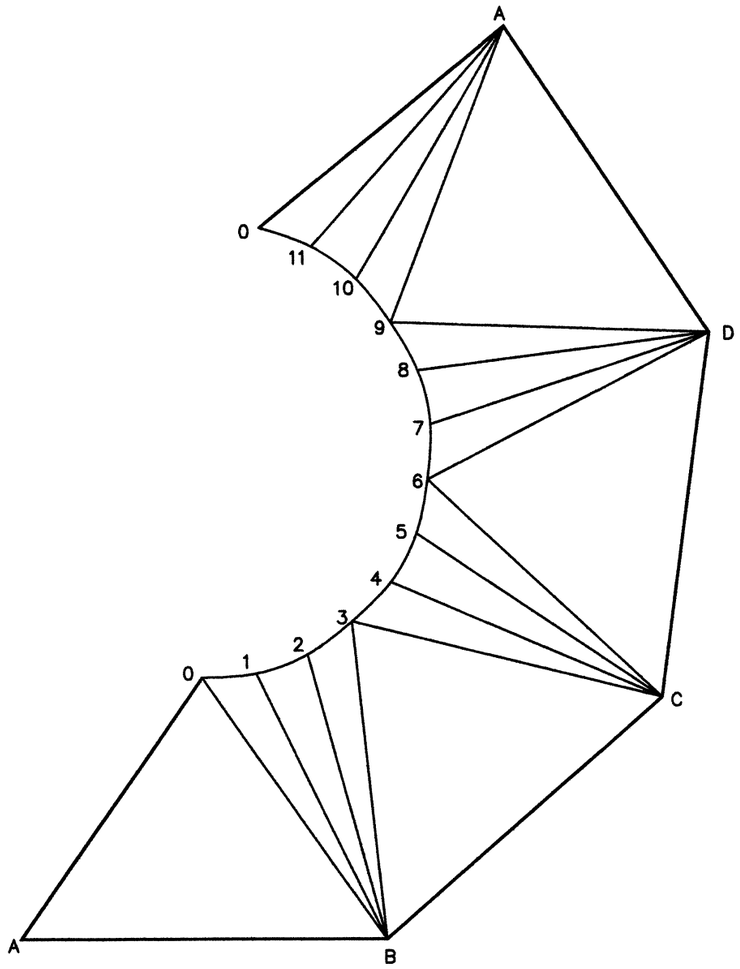




PLAN

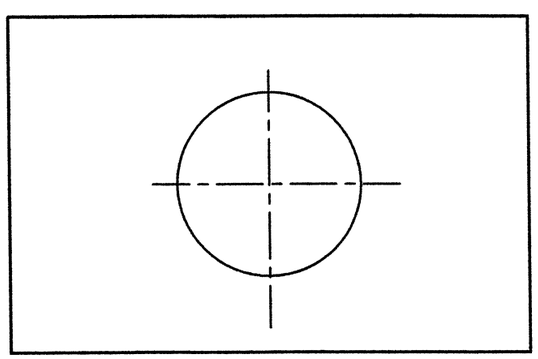


ELEVATION

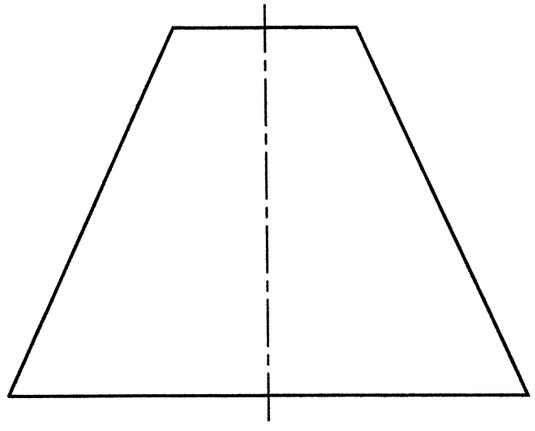


SURFACE DEVELOPMENT OF TRANSITION PIECE

Two views of a rectangle to a cylinder transition piece are shown below.
Draw the surface development.

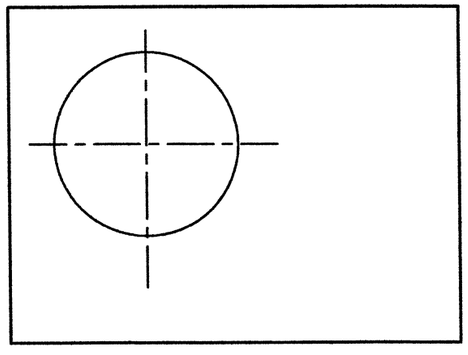


PLAN

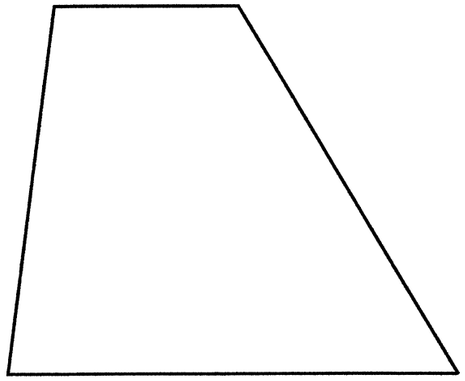


ELEVATION

Two views of a transition piece that form part of a grain hopper are shown below.
Draw the surface development of the transition piece.

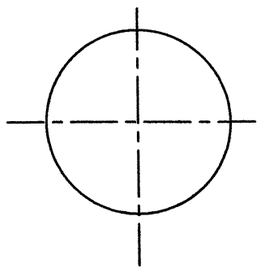


PLAN

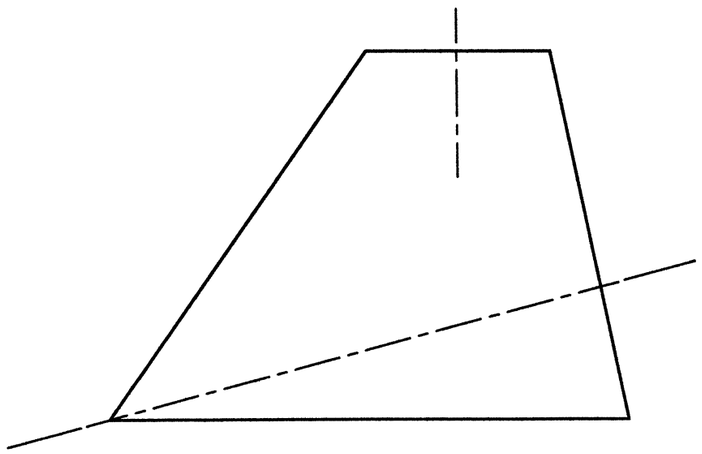


ELEVATION

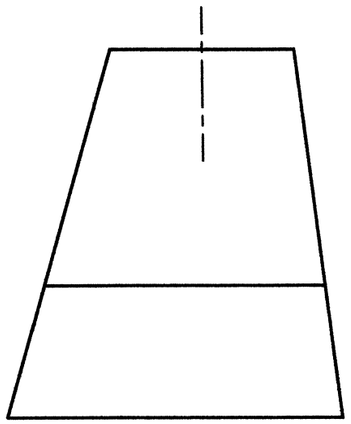
The elevation of a rectangle to cylinder transition piece, cut by a cutting plane, is shown. The complete end elevation and incomplete plan are also shown.
Draw, to the same scale;
(a) the complete sectional plan;
(b) the surface development of the transition piece after being cut by the cutting plane.



PLAN

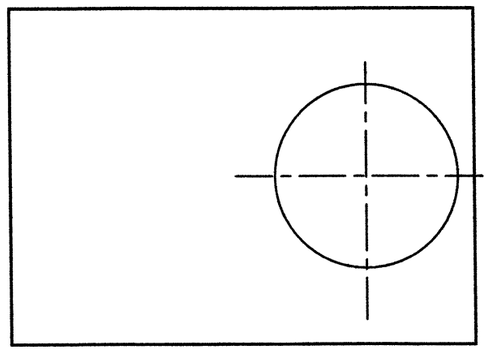


ELEVATION

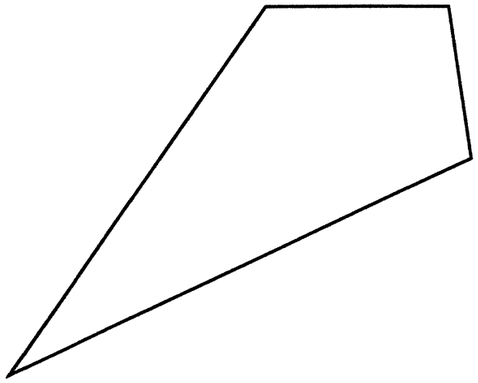


END ELEVATION

Two views of a transition piece that form part of a air condition unit are shown.
Draw the surface development of the transition piece.

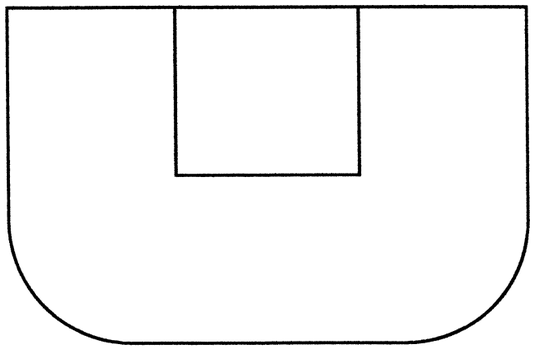


PLAN

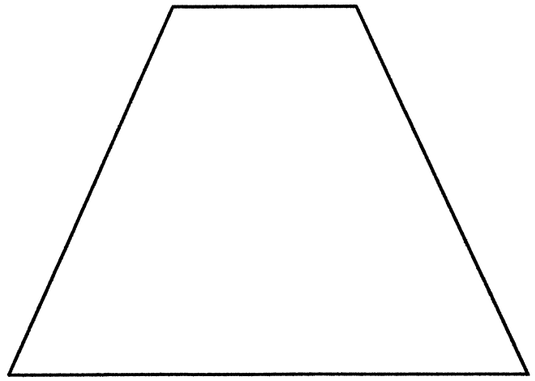


ELEVATION

Two views of a kitchen extractor hood are shown.
Draw the surface development of the hood.

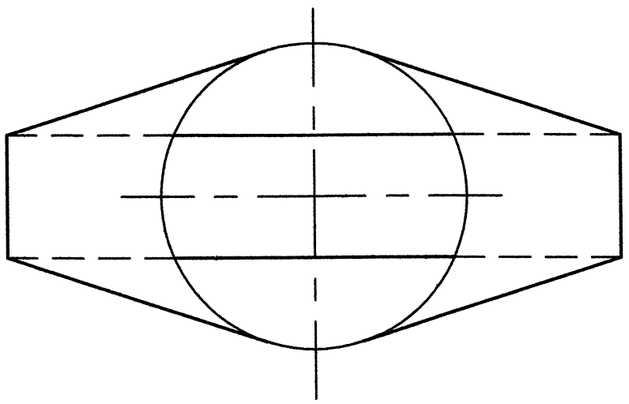


PLAN

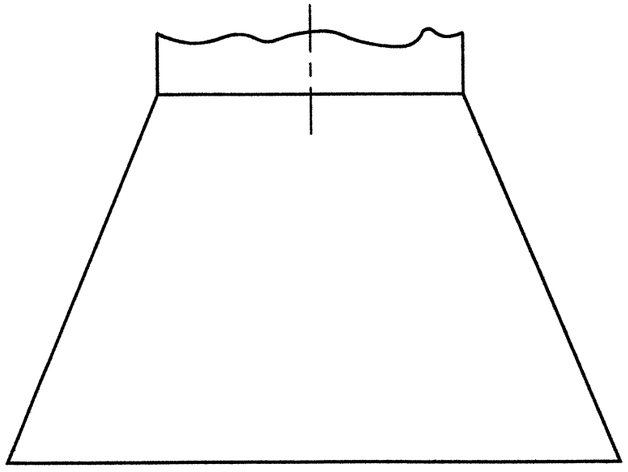


ELEVATION

The elevation and plan of a nozzle from a heat gun are shown.
The nozzle is cylindrical at the gun end and reduces at the other to a rectangle.
Draw the surface development of the nozzle.
Do not show the cylindrical sleeve section.

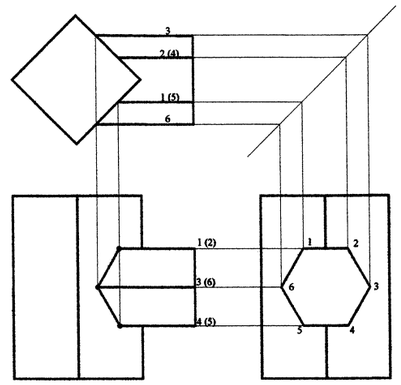


PLAN

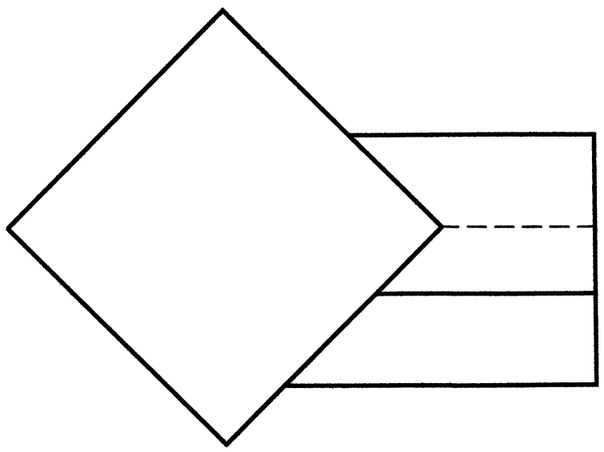


ELEVATION

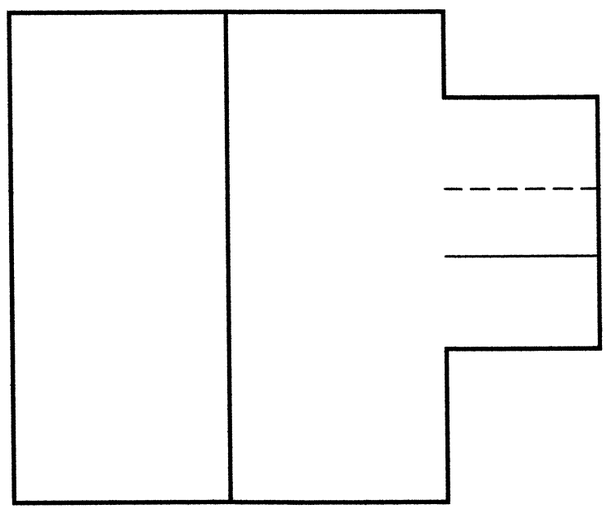
INTERSECTIONS



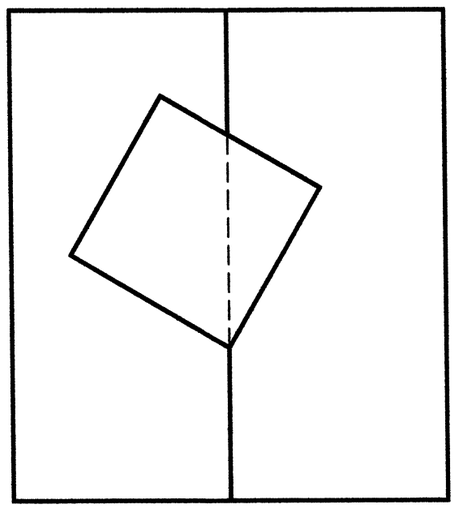
Three views showing two square prisms that intersect are shown.
Draw:
(a) the complete elevation showing the line of intersection;
(b) the surface development of the small square prism.



PLAN

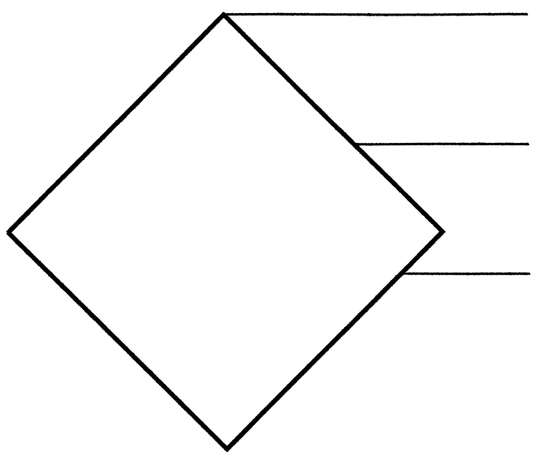


ELEVATION

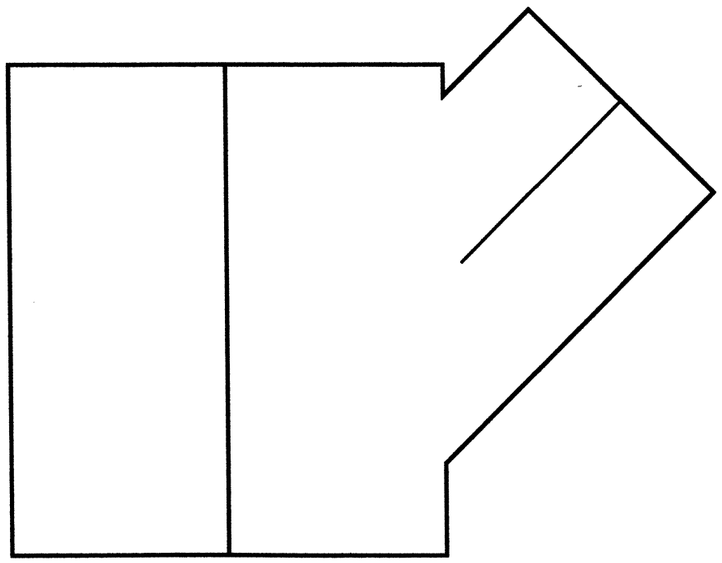


END ELEVATION

An incomplete plan and incomplete elevation of two square prisms that intersect are shown.
Draw:
(a) the complete elevation and plan showing the lines of intersection;
(b) the end elevation in the position indicated;
(c) the surface development of the inclined square prism.
Show all hidden detail.



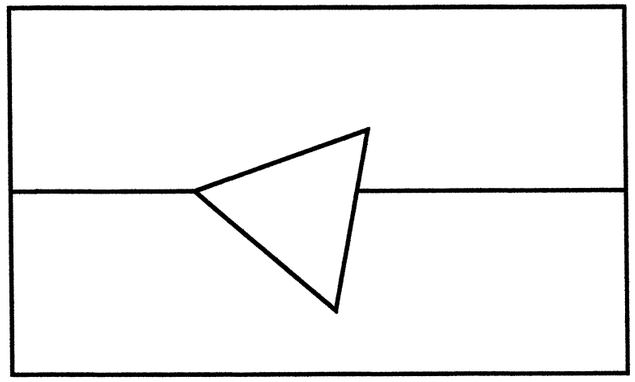
PLAN



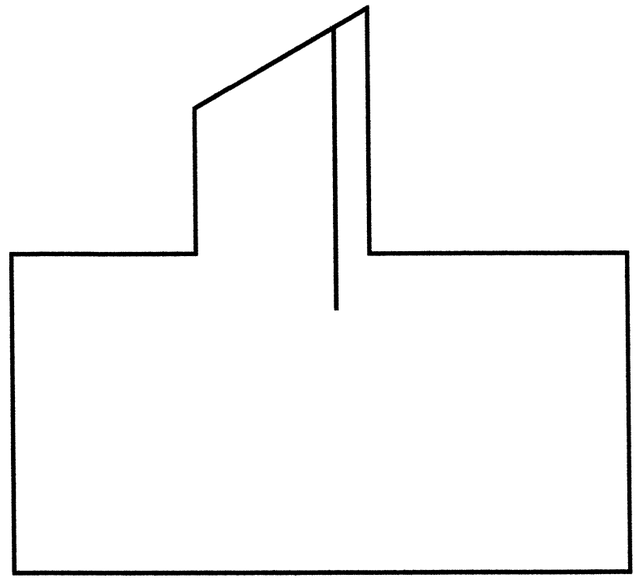
ELEVATION

END ELEVATION

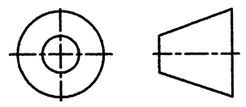
The plan and incomplete elevation of two intersecting equilateral triangular prisms are shown below.
Draw:
(a) the complete elevation
(b) the true shape of the sloping surface on the vertical prism;
(c) the surface development of the smaller prism.
Show all hidden detail.



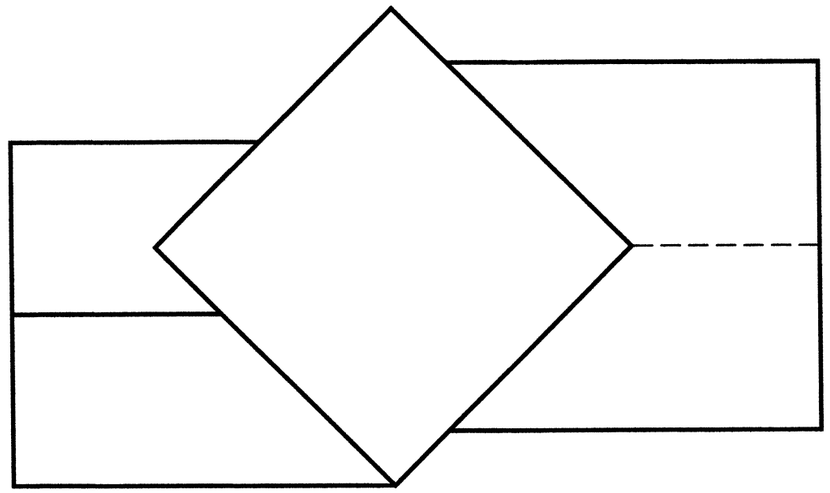
PLAN



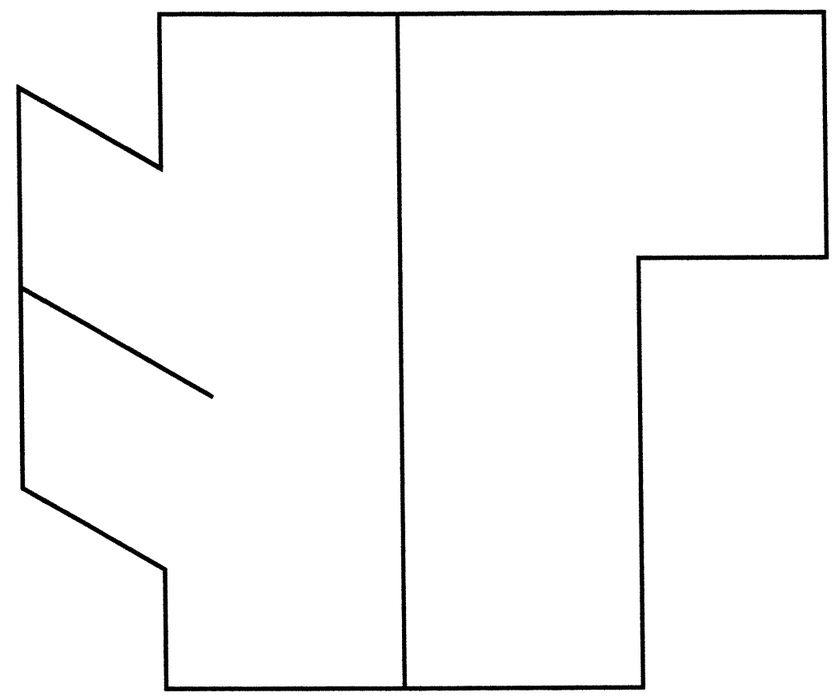
ELEVATION



An arrangement of ducting can be seen in the diagrams below. The arrangement shows the junction where a square prism and a triangular prism meet at a vertical square prism.
Draw:
(a) the complete elevation;
(b) the surface development of the large square prism.
Show all hidden detail.

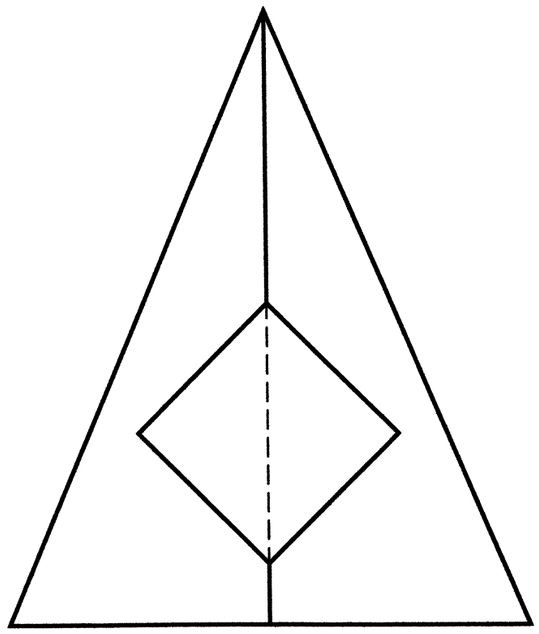


PLAN

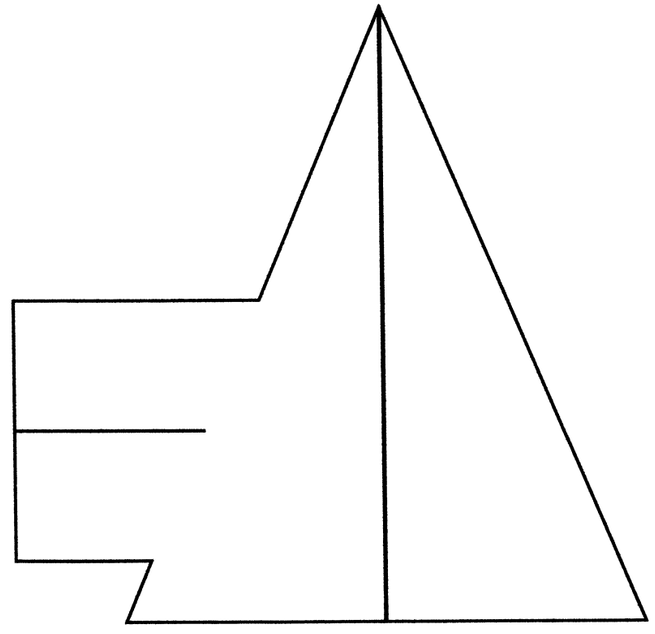


ELEVATION

The end elevation and incomplete elevation of an intersecting square prism with a square pyramid are shown below. and Draw:
(a) the complete elevation;
(b) the plan;
(c) the surface development of the square prism.

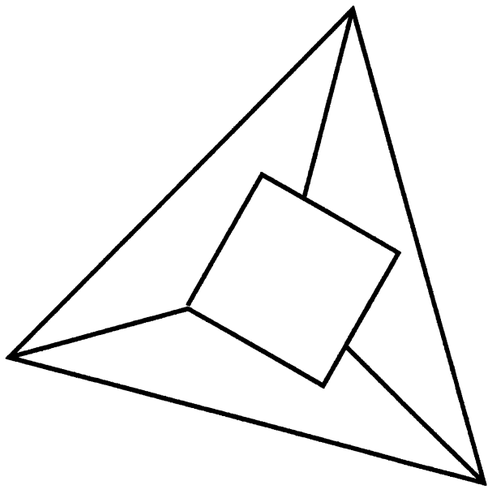


END ELEVATION

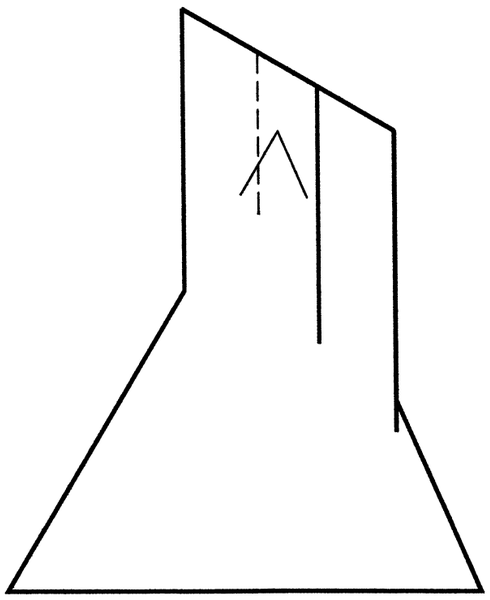


ELEVATION

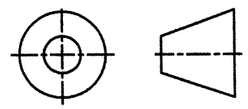
The plan and incomplete elevation of the intersection of a square prism and equilateral triangular pyramid are shown below.
Draw:
(a) the complete elevation;
(b) the surface development of the square prism.
Show all hidden detail.



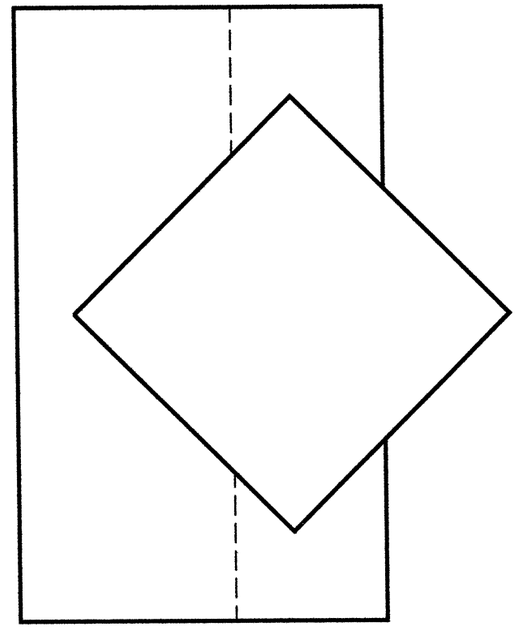
PLAN



ELEVATION

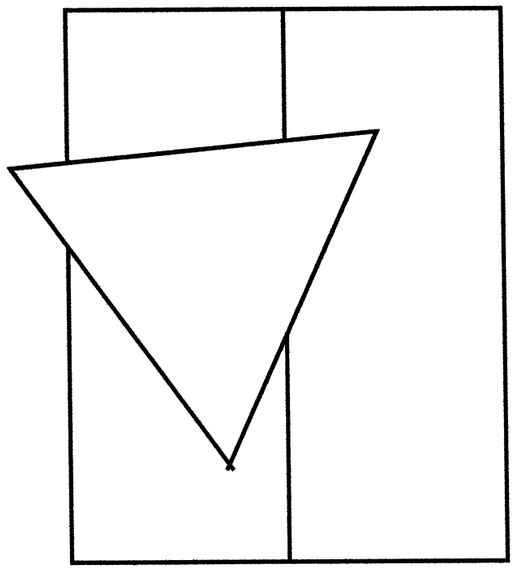


The elevation and plan of intersecting square and equilateral triangular prisms are shown below.
Draw:
(a) the end elevation in the position indicated showing the line of intersection;
(b) the surface development of the square prism.
Show all hidden detail.

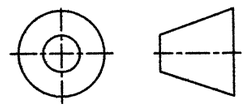


PLAN

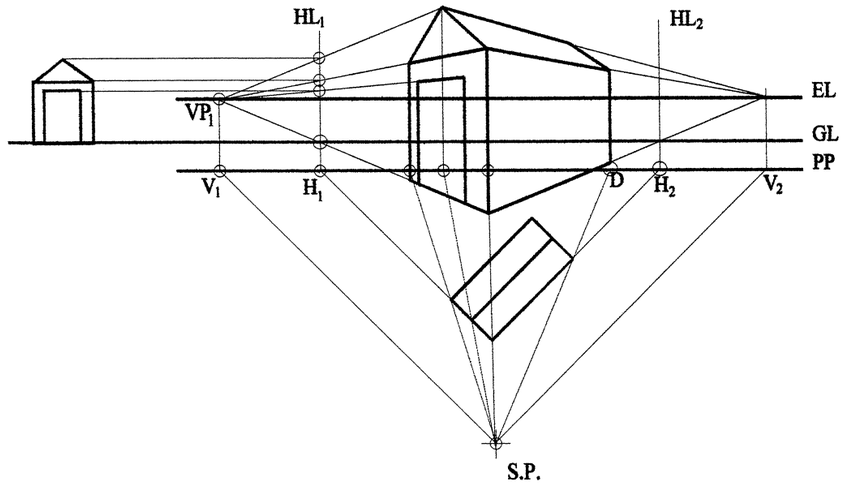
END ELEVATION



ELEVATION



MEASURED PERSPECTIVE

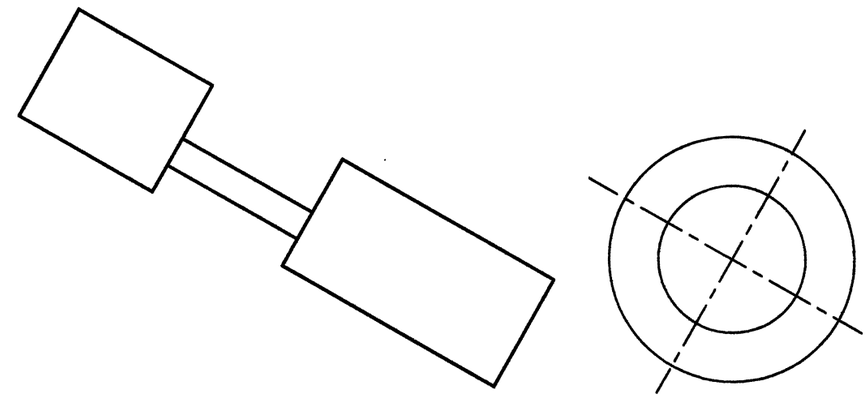


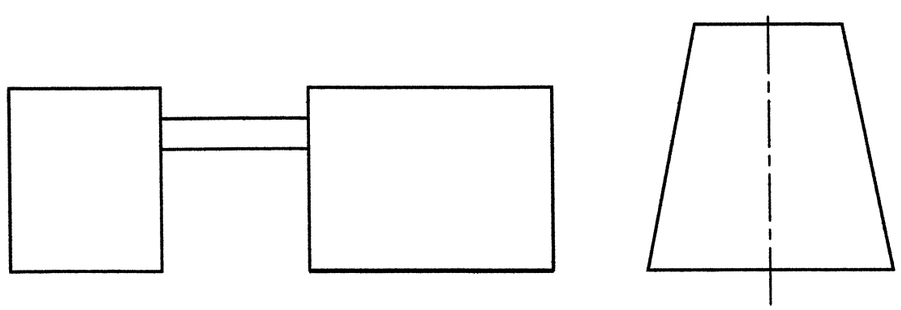
The elevation and plan show in outline the turbine house and cooling tower of a power plant. Project a 2-point measured perspective view of the power plant.
The ground line (GL), eye level (EL), picture plane (PP) and the spectator point are given.

EL

GL

PP





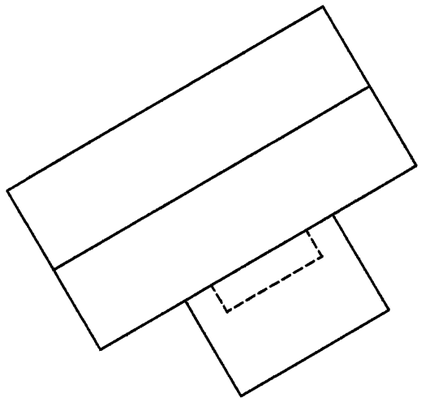
SP

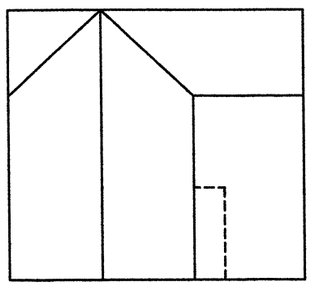
The elevation end elevation and incomplete plan showing a shopping centre and its entrance are shown.
Draw a measured 2-point perspective view of the shopping centre.
The ground line (GL), eye level (EL), picture plane (PP) and the spectator point are given.
Do not show hidden detail.

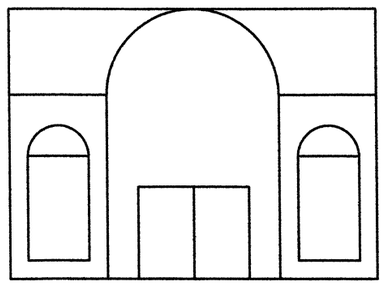
EL

GL

PP

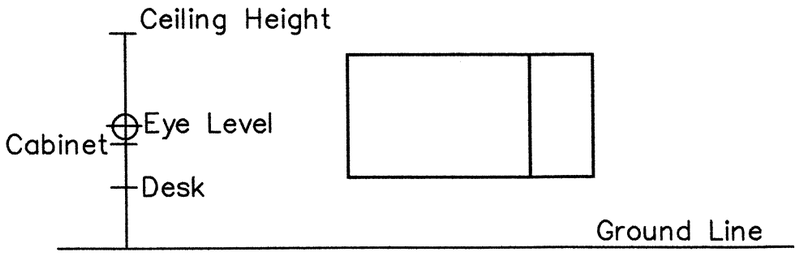


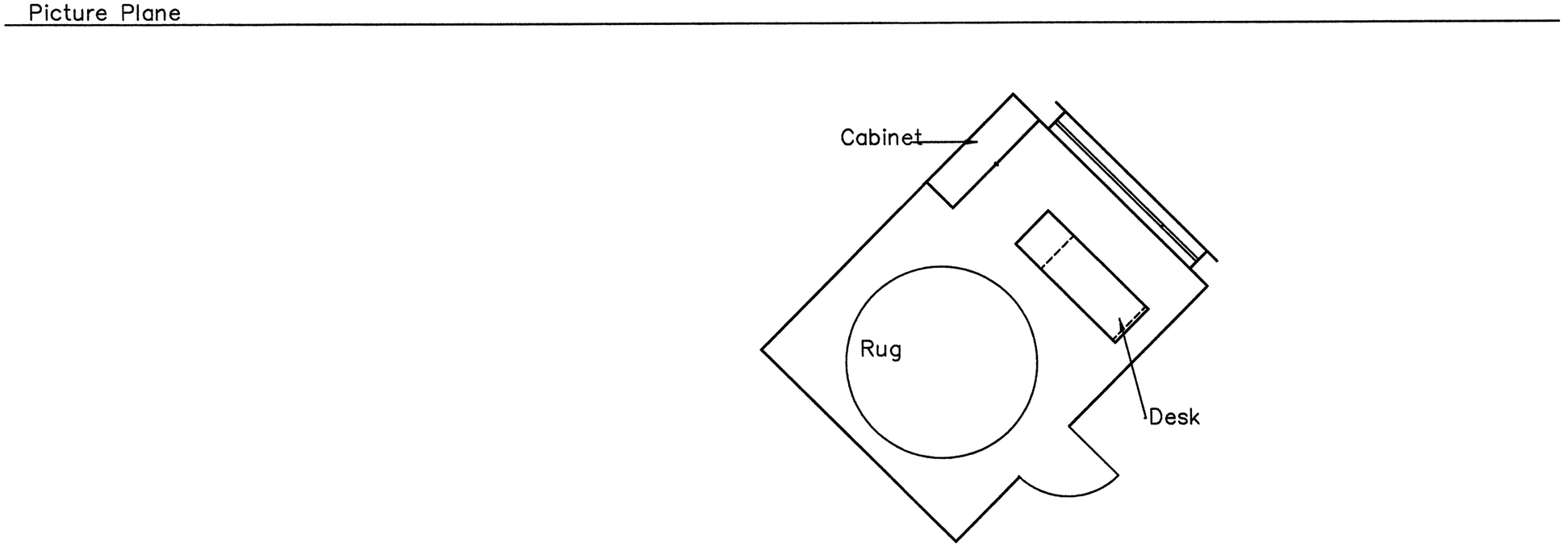




SP

The plan below shows the outline of a room. Information on the height and positions of furniture in the room is also given.
Project a internal 2-point measured perspective view of the inside of the room in order to see the desk, the cabinet and the rug.
The ground line, eye level, picture plane and the spectator point are given.



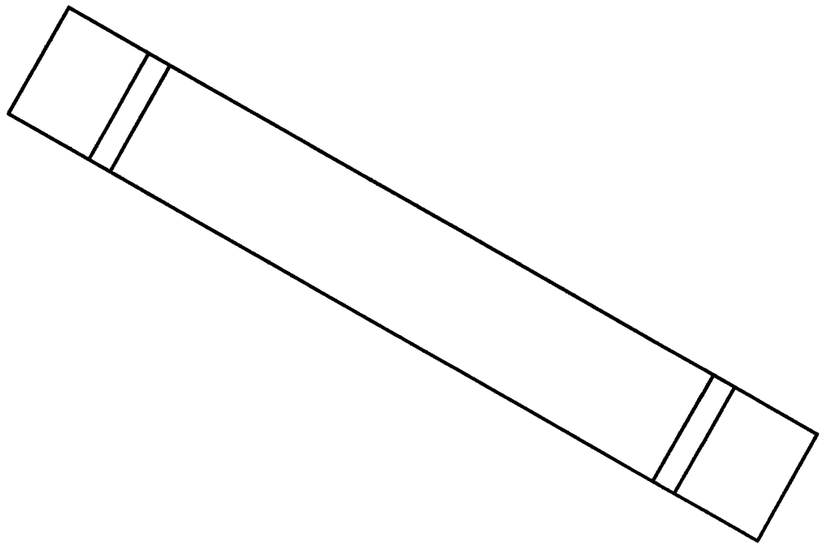


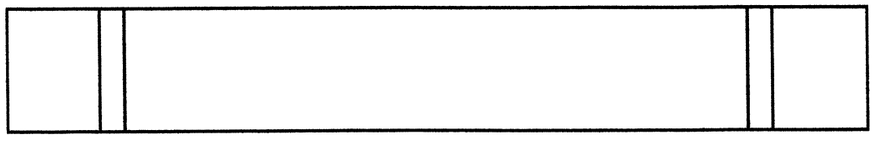
The elevation and plan show in outline a suspension bridge.
Project a 2-point measured perspective view of the bridge.
The ground line (GL), eye level (EL), picture plane (PP) and
the spectator point are given.

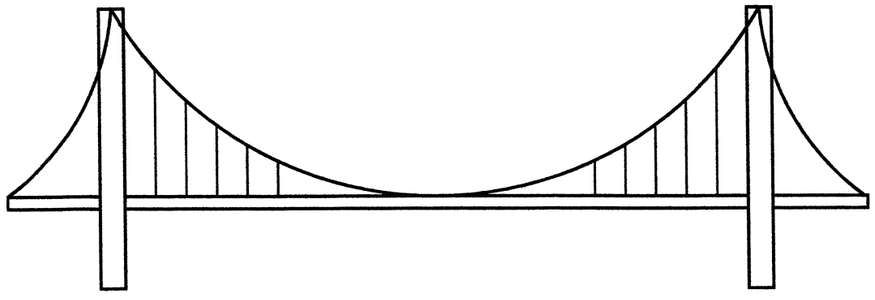
EL

GL

PP

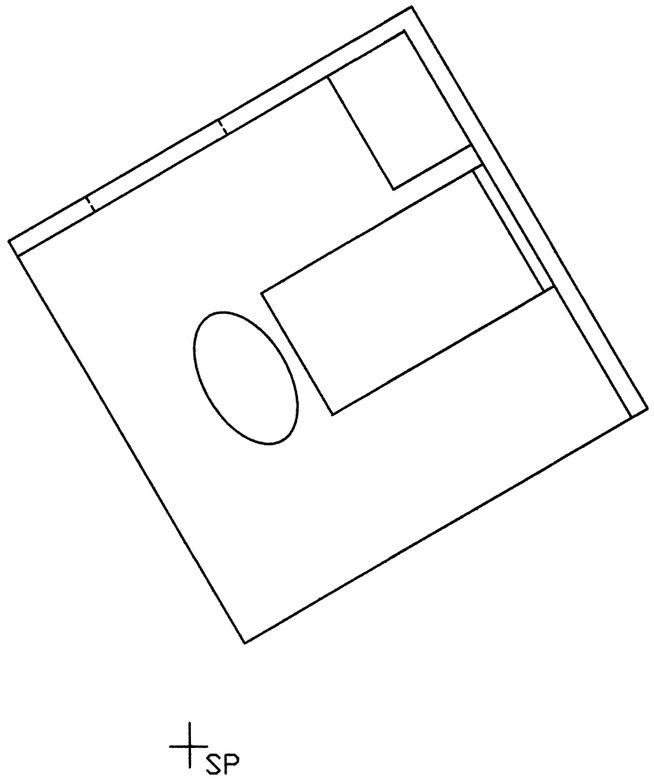


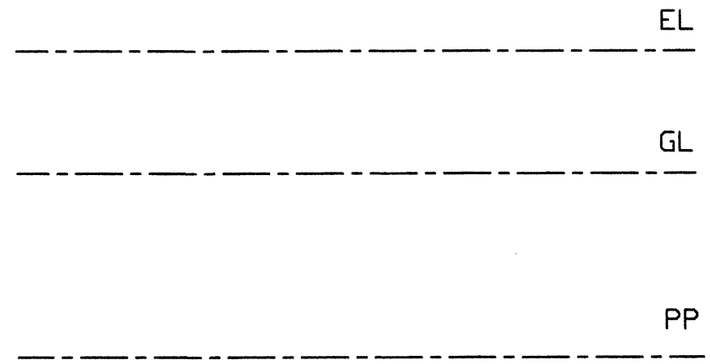


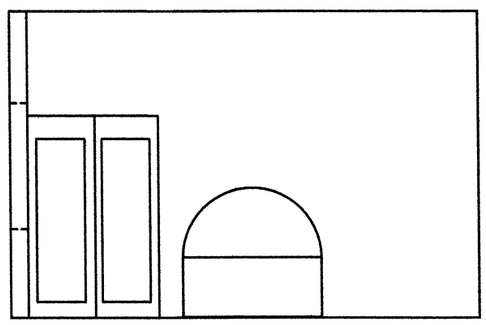


SP

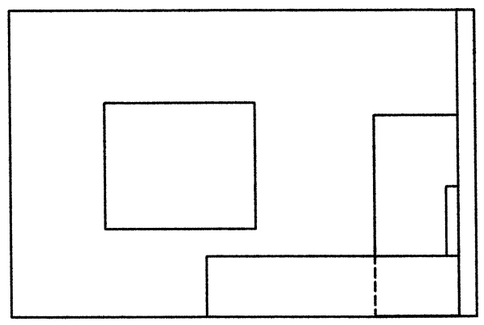
The elevation and plan of a bedroom are shown. The bedroom shows a window, a wardrobe, a bed with a semi-circular headboard and an eliptical rug.
The ground line (GL), eye level (EL), picture plane (PP) and the spectator point are given.
Project a 2-point measured perspective view of the bedroom.







ELEVATION



END ELEVATION