To Find the True Shape of an Object on an Oblique Plane

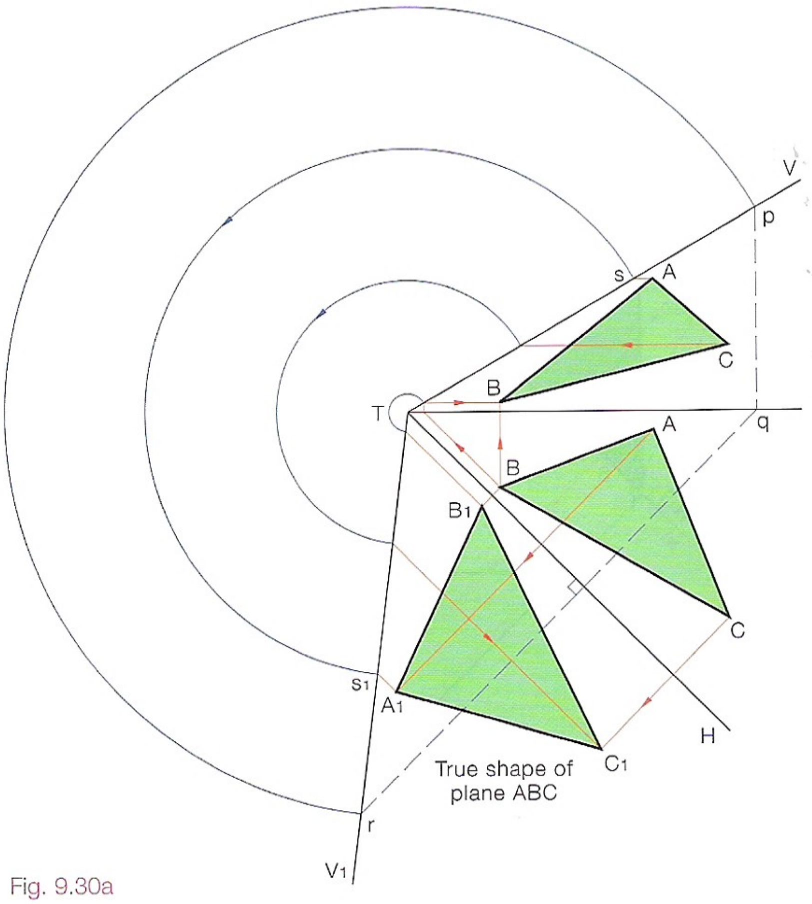


Fig. 9.30a

Method 1: Rebatment of the Plane

Fig. 9.30a

What is happening here is that the plane is rotated onto the horizontal plane and is hinged about the horizontal trace HT.

(1) From any point p on the vertical trace drop a vertical to the xy line giving q.

(2) Draw a perpendicular to the horizontal trace from q and extend.

(3) With centre T and radius Tp rotate to cut this perpendicular giving r.

(4) Join r to T giving V_1HT, the rebatted plane.

To find the triangle on the rebatted plane:

(1) From point A in elevation project horizontally to the VT giving s.

(2) With T as centre rotate point s to V_1T giving s_1.

(3) Project s_1 parallel to the HT.

(4) From A in plan project across perpendicular to the HT to locate A_1.

(5) Repeat for the other points.

Method 2: Rebatment of the Plane

Fig. 9.30b

This is very similar to Method 1.

(1) Rebat the plane as before.

(2) Project A in plan parallel to the HT to give point s on the xy line.

(3) Project s perpendicular to the HT to give s_1 on the V_1T line.

(4) Project s_1 parallel to the HT.

(5) Project from A in the plan, perpendicular to the HT to locate A_1.

(6) Repeat for other points.

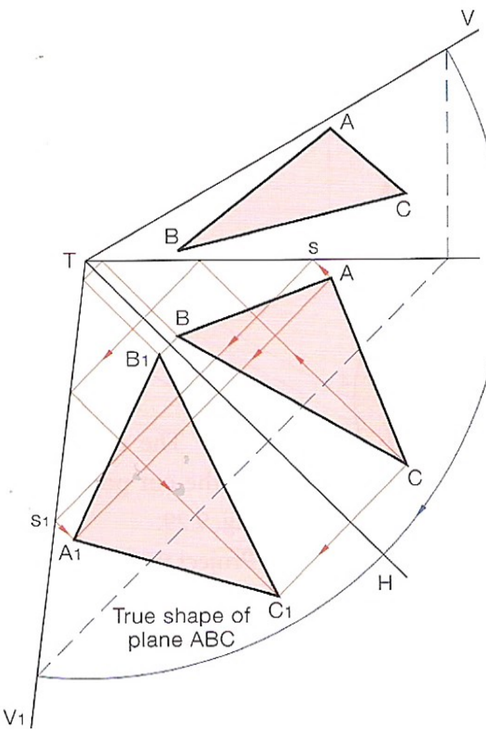


Fig. 9.30b

Method 3: Auxiliary Elevation and Rebatment

Fig. 9.31

An edge view of the oblique plane is found and the plane can then be easily rebatted onto the horizontal plane.

(1) View along the HT to see the plane as an edge view. Extend the horizontal trace.

(2) Draw x_1y_1 perpendicular to the HT line extended.

(3) Choose any point p on the xy line and project to the auxiliary.

(4) Find the height of point p from the elevation, height h, and measure on the auxiliary.

(5) Draw the plane in the auxiliary V_1TH.

(6) Project the triangular surface ABC to the auxiliary.

(7) Rotate the points A_1B_1C in the auxiliary, about point T, onto the x_1y_1 line.

(8) Project back to plan.

(9) Project from the plan perpendicular to the HT to locate the points A_2B_2 and C_2.

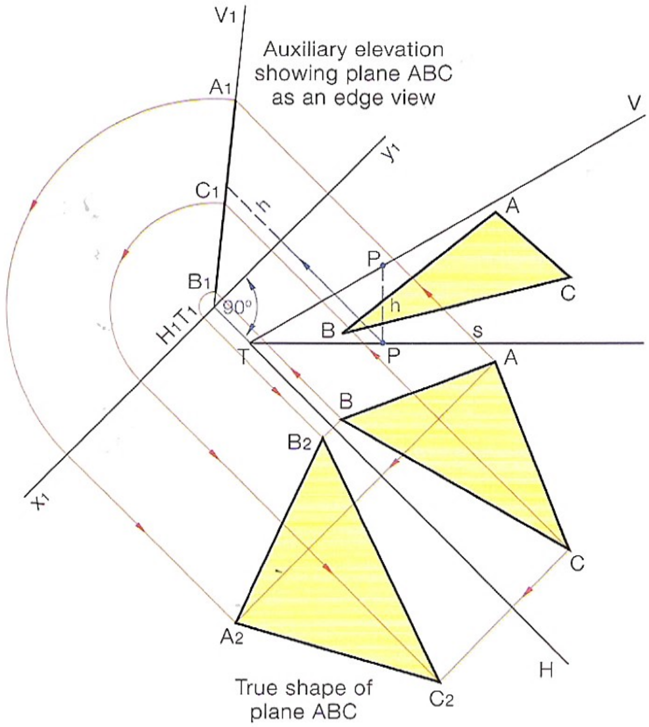


Fig. 9.31

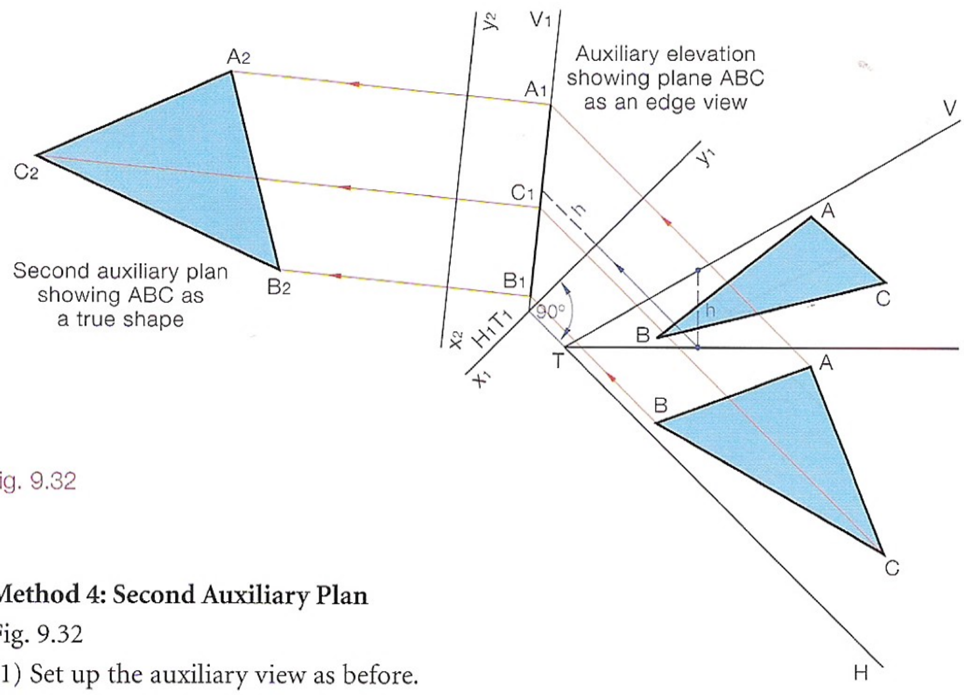


Fig. 9.32

Method 4: Second Auxiliary Plan

Fig. 9.32

(1) Set up the auxiliary view as before.

(2) Draw x_1y_1 parallel to $V_1T_1H_1$.

(3) Project points $A_1B_1C_1$ perpendicular to x_2y_2.

(4) The distance from x_1y_1 to A is taken and used to locate A_2.

(5) Similar for B_2 and C_2.

Worked Examples

Fig. 9.33 shows the elevation and plan of a regular hexagonal prism. The solid is cut by the oblique plane VTH.

(i) Draw the plan and elevation of the solid when it is cut by the oblique plane VTH.

(ii) Draw the true shape of the cut surface of the prism.

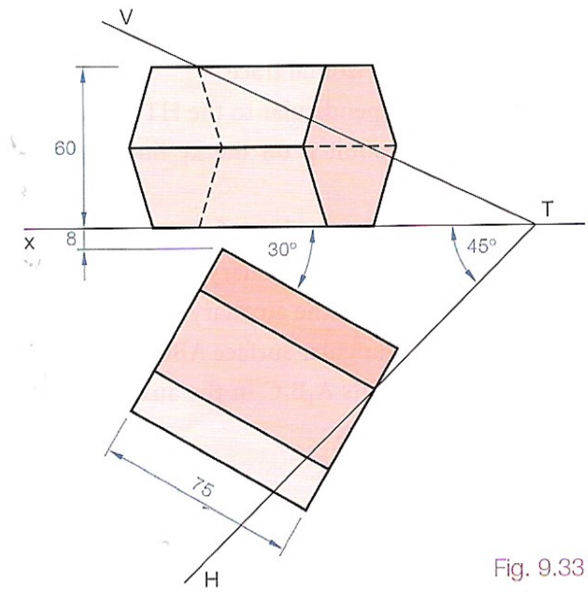


Fig. 9.33

(1) Draw the given views.

(2) Project an auxiliary elevation viewing in the direction of the horizontal trace. This will show the oblique plane as an edge view. The cut points 1, 2, 3 and 4 are found.

(3) These points are projected to plan, giving two point 1's and two point 2's.

(4) The elevation is found by projection.

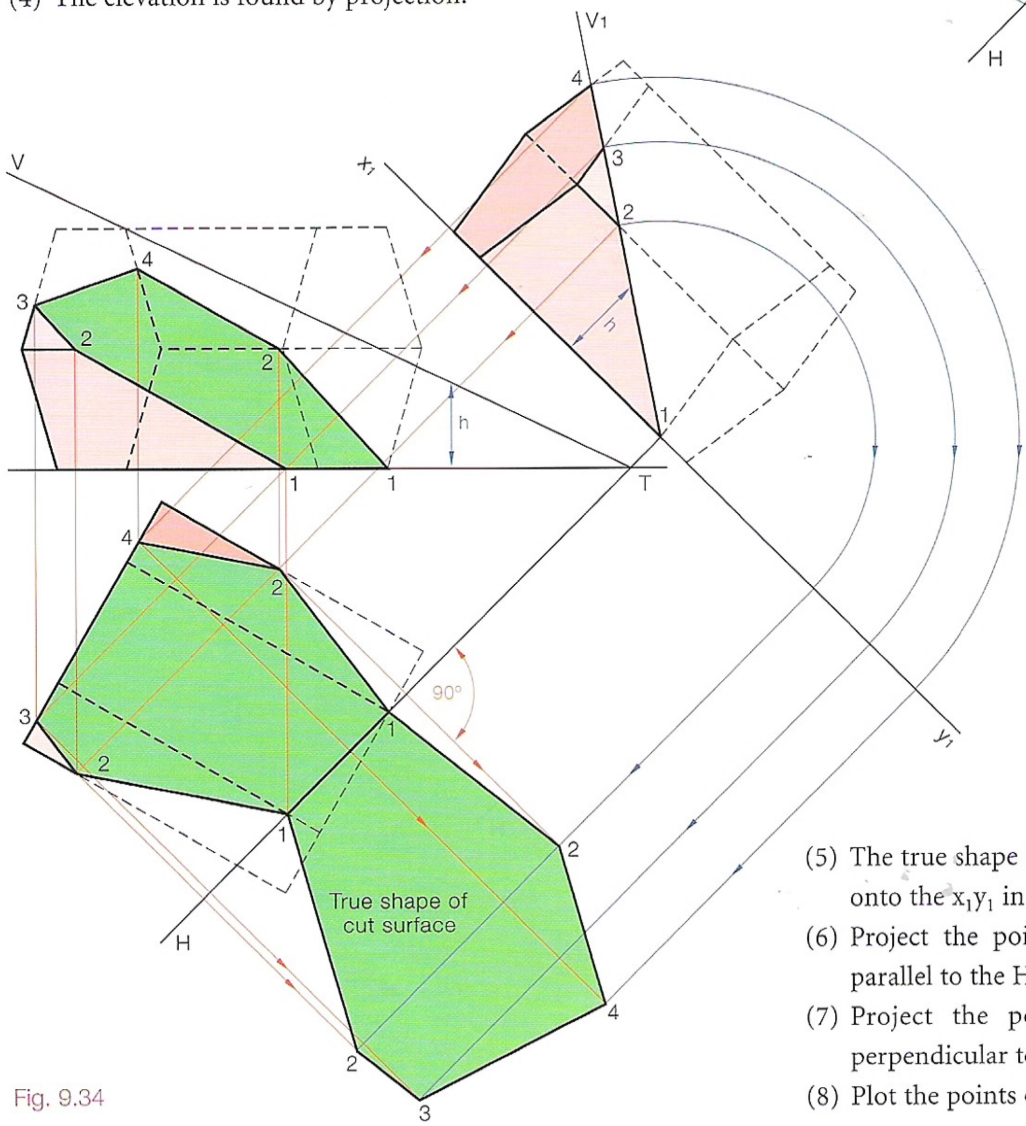


Fig. 9.34

(5) The true shape is found by rebatting the plane onto the x_1y_1 in the auxiliary view.

(6) Project the points down from the auxiliary parallel to the HT.

(7) Project the points across from the plan perpendicular to the HT.

(8) Plot the points on the true shape, Fig. 9.34.

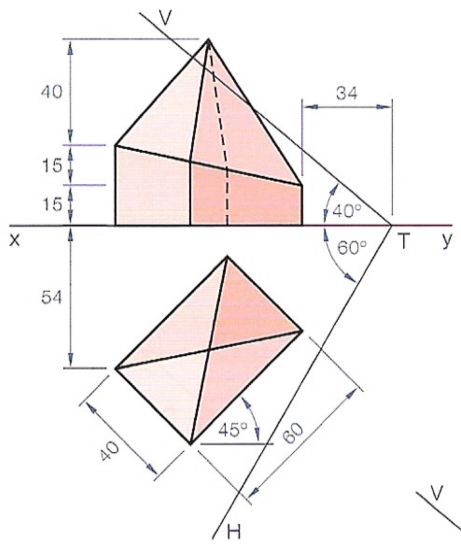


Fig. 9.35

The plan and elevation of a solid which is cut by an oblique plane VTH is shown in Fig. 9.35.

(i) Draw the plan and elevation of the solid when it is cut by the oblique plane VTH.

(ii) Draw the true shape of the cut surface of the solid.

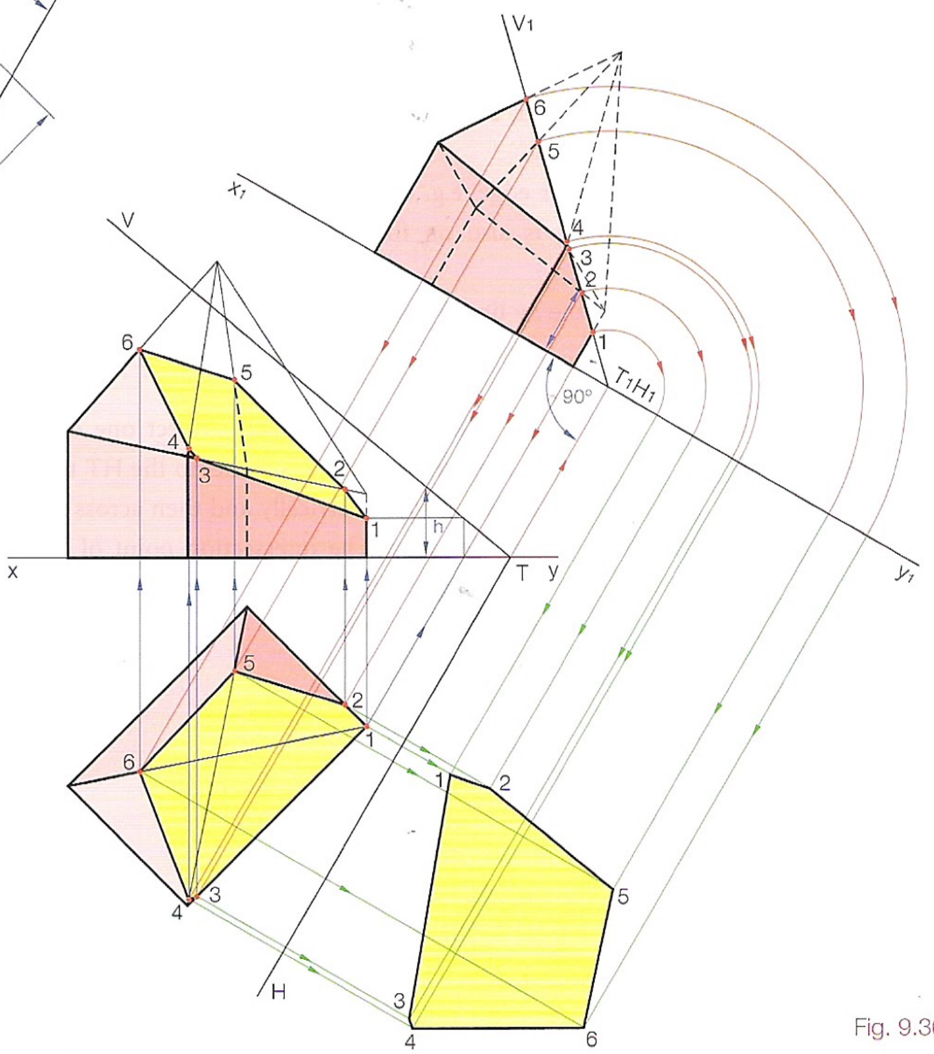


Fig. 9.36

(1) Draw the given views.

(2) Project an auxiliary elevation viewing along HT.

(3) Draw the solid in the auxiliary thus determining six points on the cut surface.

(4) Project the points down from the auxiliary. Point 1 is on a vertical and will be in the corner in plan.

(5) Project all points to elevation. Point 1 being on a vertical, may not be projected directly, but must be brought parallel to the HT to the xy line, vertically to the VT and then horizontally.

(6) The true shape is found by rebatting the oblique plane in the auxiliary, Fig. 9.36.

FINDING THE TRACES OF A PLANE

Given the plan and elevation of a lamina ABC. Find the traces of the plane that contains this lamina. Fig 9.37

(1) Draw the plan and elevation as given.
(2) In elevation extend an edge, e.g. CA, until it hits the xy line and the horizontal plane at point p.
(3) Extend line CA in plan also.
(4) Drop point p to hit CA in plan, at point q. Point q is on the horizontal trace.
(5) Repeat this process for another edge, e.g. CB. This will find point s which is also on the horizontal trace.
(6) Join s and q and extend to the xy line. This is the horizontal trace.

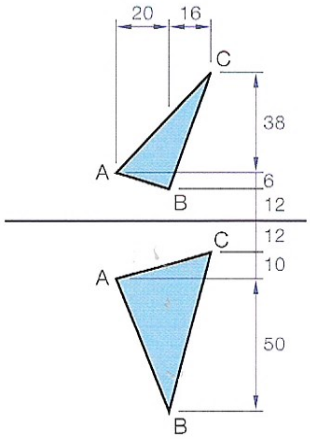


Fig. 9.37

(7) To find the vertical trace. Project one of the points in plan, e.g. C, parallel to the HT to the xy line. Project vertically and then across from the elevation. The intersection point of these two lines is a point on the vertical trace. Draw the trace, Fig. 9.38.

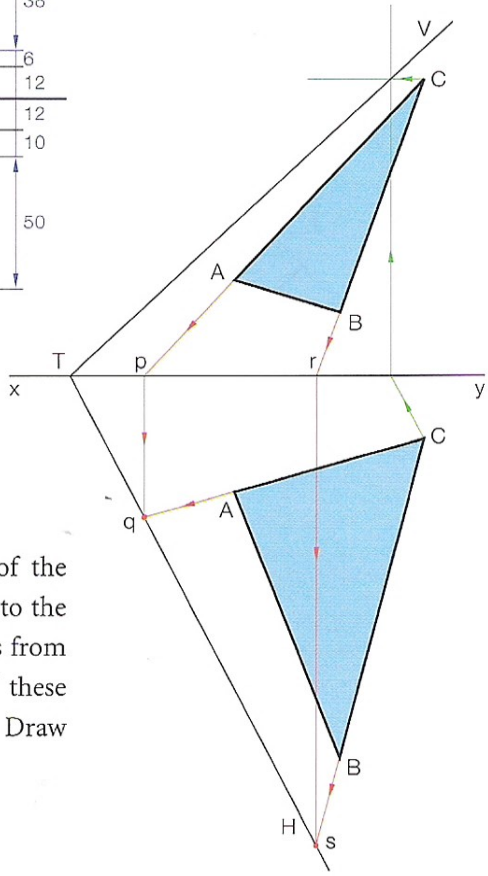


Fig. 9.38

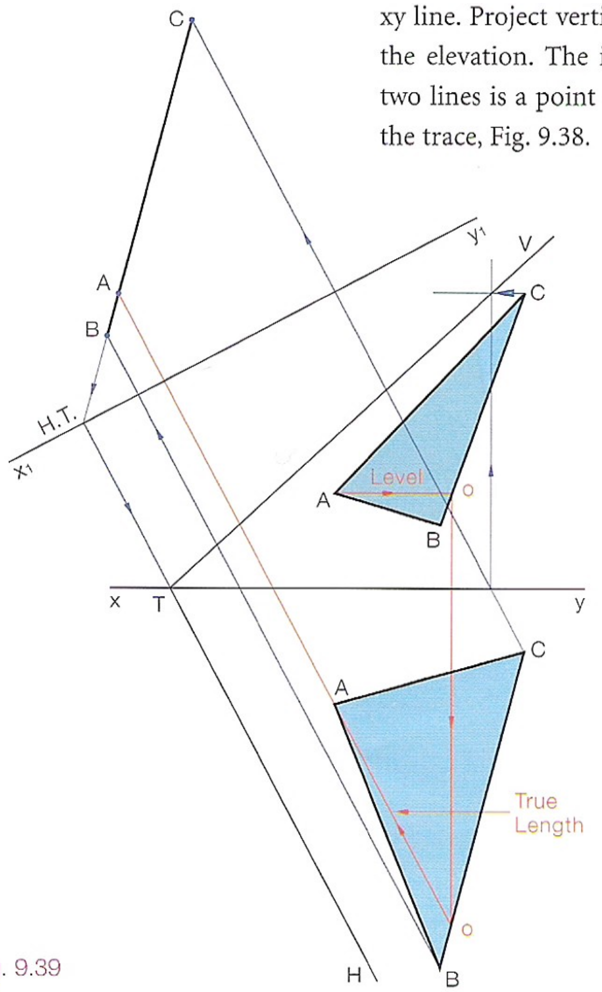


Fig. 9.39

Alternative Method

Fig. 9.39

(1) Draw the plan and elevation.
(2) In elevation draw a level line across the surface. Line AO for example.
(3) Find this line in plan. Point O is projected to plan and is found on edge CB. Join point O to corner A.
(4) View in the direction of OA and project an auxiliary elevation. The lamina projects as an edge view because we are viewing along a true length on its surface.
(5) Extend the edge view in auxiliary to the x_1y_1 line thus giving a point view of the HT. Project the horizontal trace back to plan.
(6) Find the vertical trace as above.

Fig. 9.40 shows the plan and elevation of a solid which is cut by the oblique plane VTH.

(i) Draw the plan and elevation of the solid when it is cut by the oblique plane VTH.

(ii) Draw the horizontal and vertical traces of a plane that contains surface A of the solid.

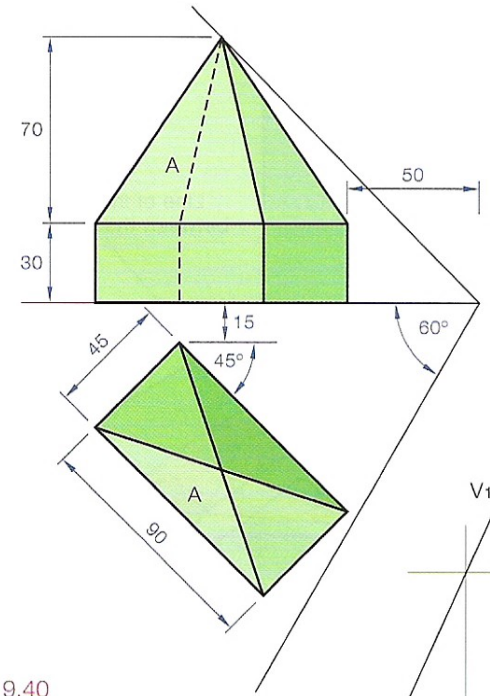
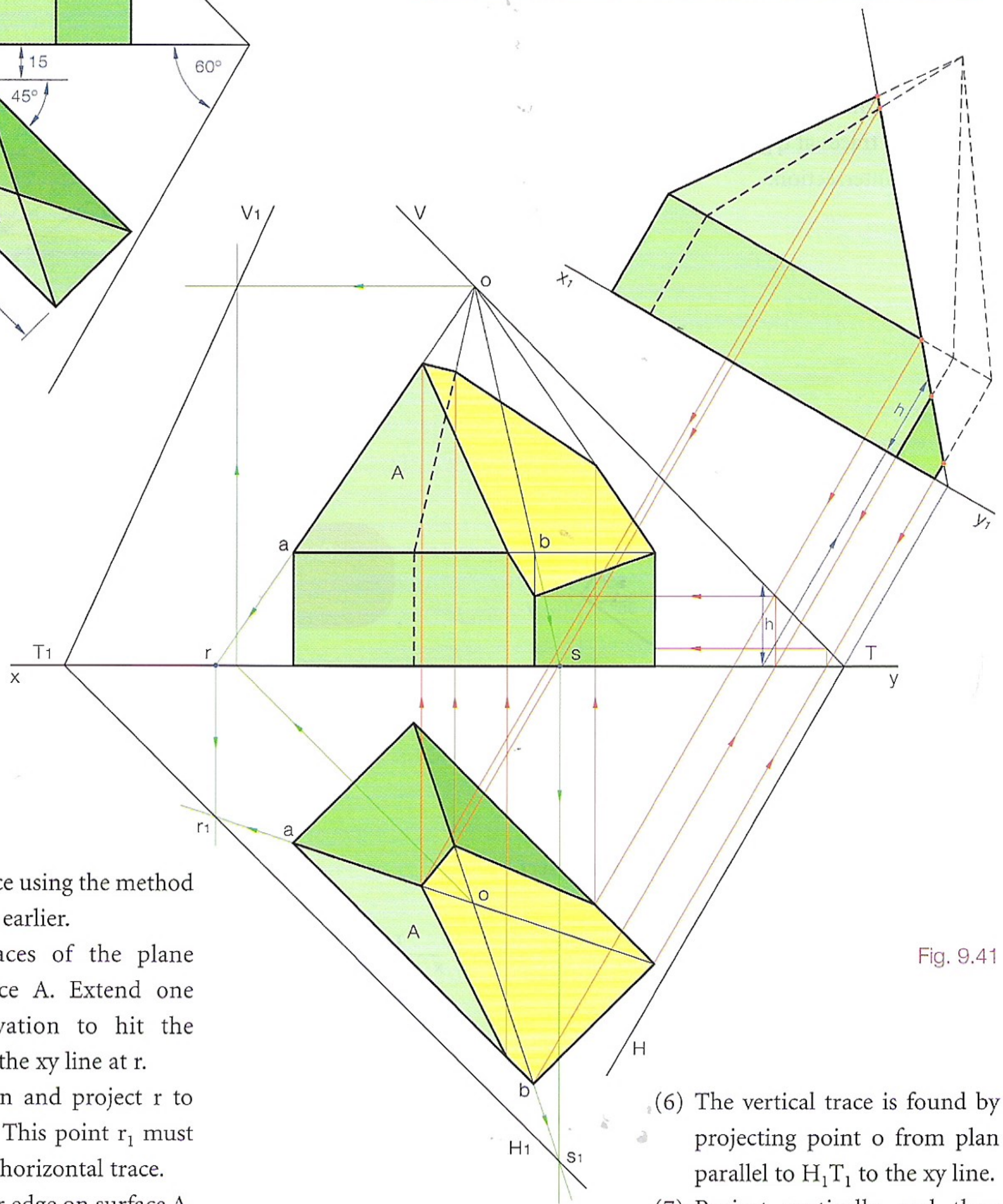


Fig. 9.40



(1) Find the cut surface using the method already explained earlier.

(2) To find the traces of the plane containing surface A. Extend one edge oa in elevation to hit the horizontal plane, the xy line at r.

(3) Extend oa in plan and project r to meet it giving r_1. This point r_1 must be a point on the horizontal trace.

(4) Repeat for another edge on surface A, edge ob. This finds point s on the horizontal trace.

(5) Join s_1 to r_1 and extend to the xy line. This is the horizontal trace.

Fig. 9.41

(6) The vertical trace is found by projecting point o from plan parallel to H_1T_1 to the xy line.

(7) Project vertically and then horizontally across from point o in elevation, giving a point on the V_1T_1 line, Fig. 9.41.

INTERSECTING OBLIQUE PLANES

The diagram, Fig. 9.42, shows a pictorial view of the planes of reference and two intersecting oblique planes.

When two planes intersect the line of intersection will always be a straight line.

It should be noted from the diagram that the intersection of the two horizontal traces HT and H_1T_1 at p gives one end of the line of intersection. Similarly the intersection of the two vertical traces at q gives the other end of the line of intersection.

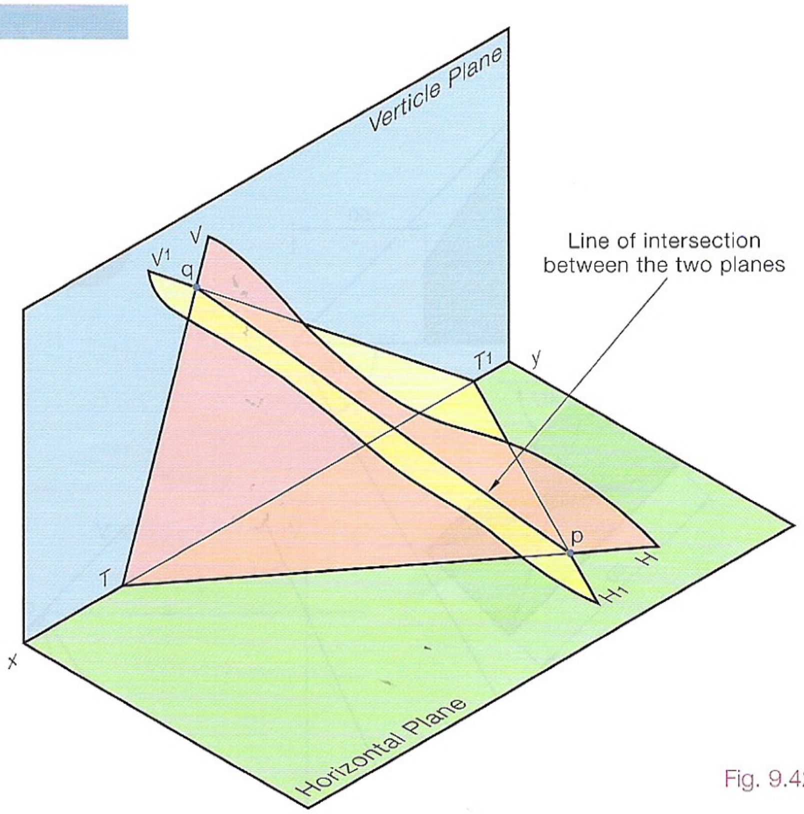


Fig. 9.42

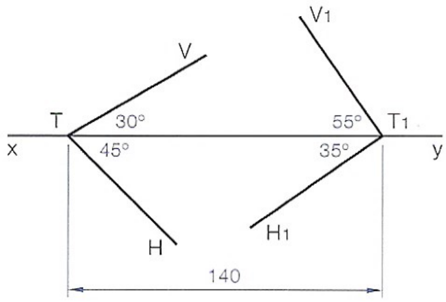


Fig. 9.43a

Given two oblique planes VTH and $V_1T_1H_1$ to find the line of intersection between them. Fig. 9.43a

(1) Extend the vertical traces until they intersect at q.

(2) Extend the horizontal traces until they intersect at p. Point q is the elevation of one end of the line of intersection and point p is the plan of the other end.

(3) Project p to elevation (xy line) and join to q.

(4) Project q to plan (xy line) and join to p, Fig. 9.43b.

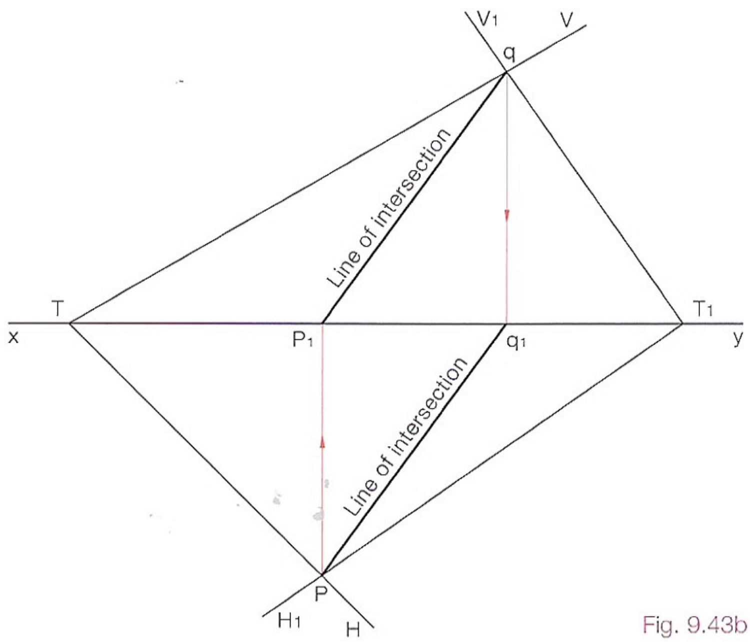


Fig. 9.43b

To find the true length of the line of intersection between two oblique planes.

(1) Find the line of intersection as above.

(2) Consider pq as the hypotenuse of a right-angled triangle that stands vertically underneath the line of intersection. Rotate this triangle until it lies horizontally, thus showing the true length of the line pq, Fig. 9.44.

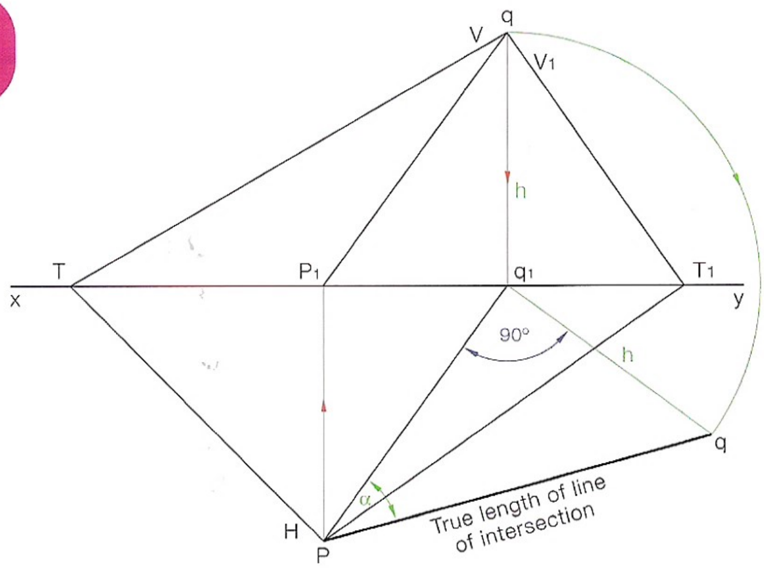


Fig. 9.44

Alternative method of finding the true length of the line of intersection. Fig. 9.45

(1) With the compass on q_1 rotate point p to p_2 on the xy line.

(2) Join p_2 to q giving the true length of the line of intersection.

Note: In both methods the true angle, α, that the line makes with the horizontal plane is also found.

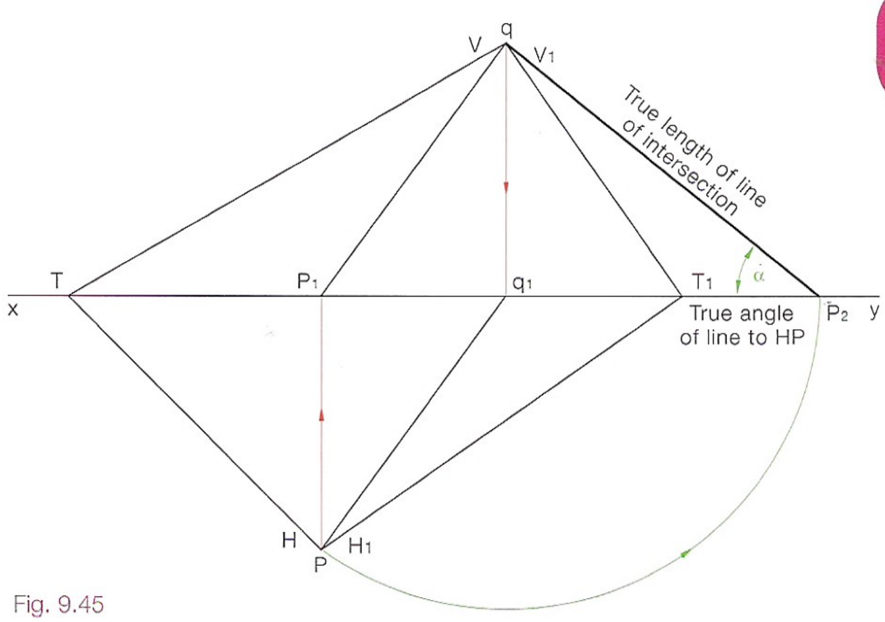


Fig. 9.45