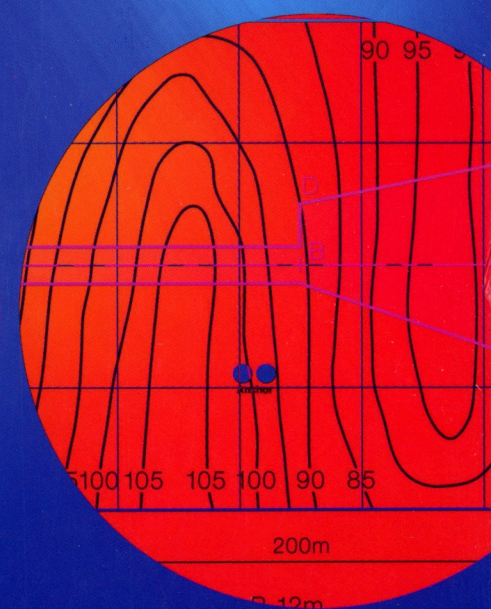
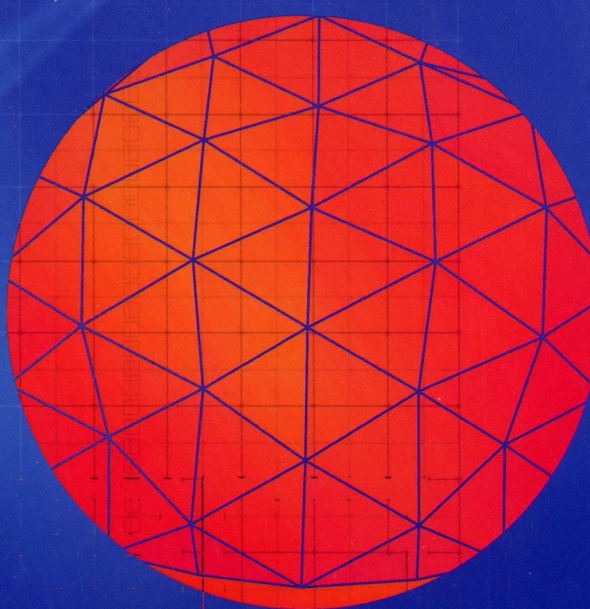
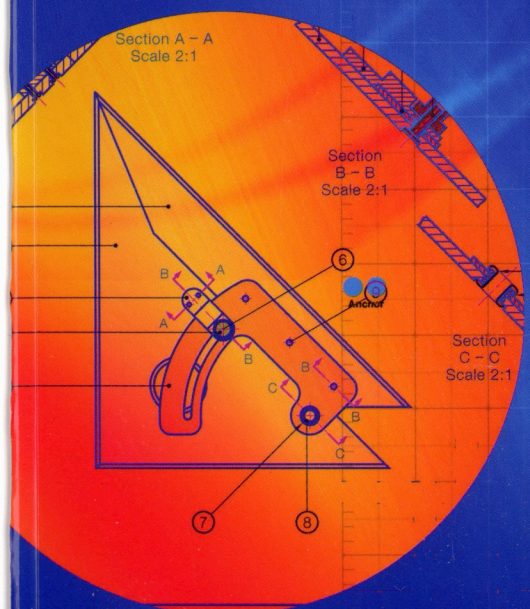


# GRAPHICS IN DESIGN & COMMUNICATION

2

CAD AND APPLIED GRAPHICS



DAVID ANDERSON



## Hyperbolic Paraboloid (contd.)

The hyperbolic paraboloid is a warped surface and therefore cannot be developed. It can also be referred to as a warped quadrilateral. We have seen earlier that it can be considered to be a surface generated by a straight line. The straight line is called a **generatrix**. This straight line moves along two non-parallel, non-intersecting lines (skew lines) called **linear directrices**. All this can be clearly seen from the previous work on this surface. What perhaps is not so clear is that the

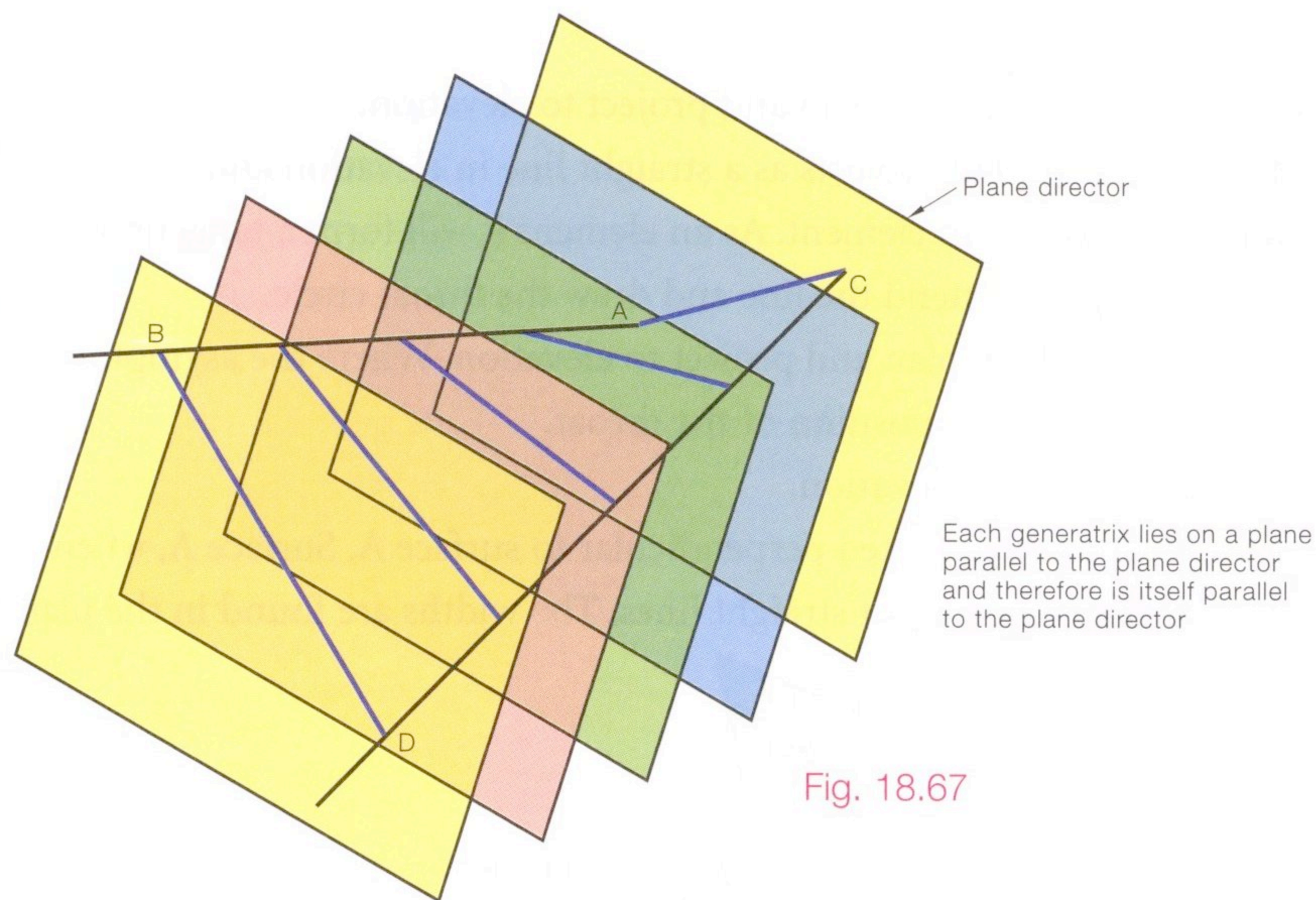


Fig. 18.67

No matter what hyperbolic paraboloid we have, we can get an edge view of its plane director by getting auxiliary views which will show its generatrices as parallel.

The plane director need not be one of the reference planes. In Fig. 18.69 the plane director is a vertical plane that is simply inclined. In plan we see the edge view of the plane director and all the elements appear parallel to it.

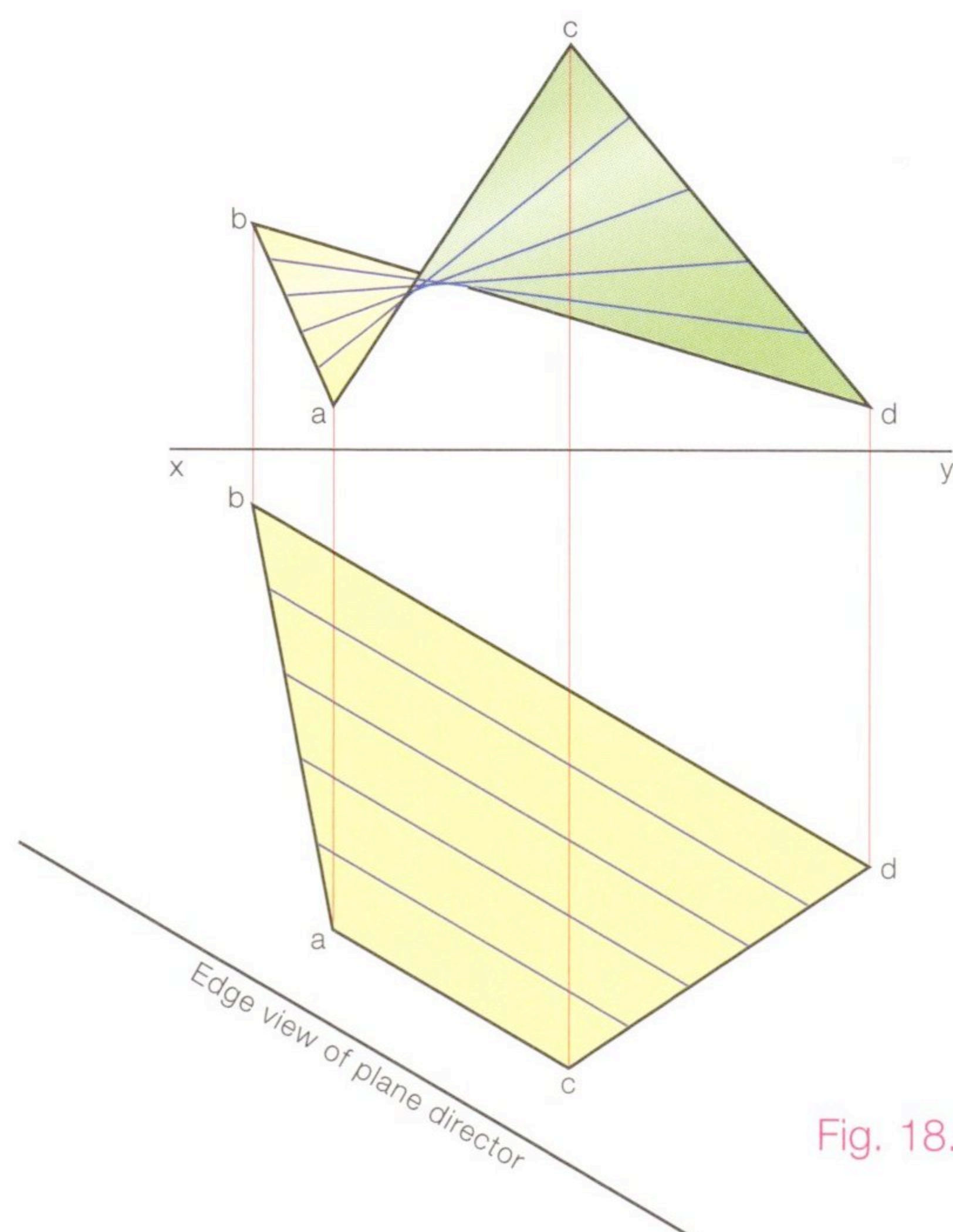


Fig. 18.69

generatrix, as it slides along the linear directrices, must always stay parallel to a plane, called the **plane director**. In fact, because the hyperbolic paraboloid is a doubly ruled surface, it has two sets of generatrices, two sets of linear directrices and two sets of plane directors.

Fig. 18.68 shows the plan and elevation of a hyperbolic paraboloid having two linear directrices  $ad$  and  $bc$ . The vertical plane is the plane director. Since the  $xy$  line in plan represents the edge view of the vertical plane, all the generatrices will be parallel to the  $xy$  line in plan.

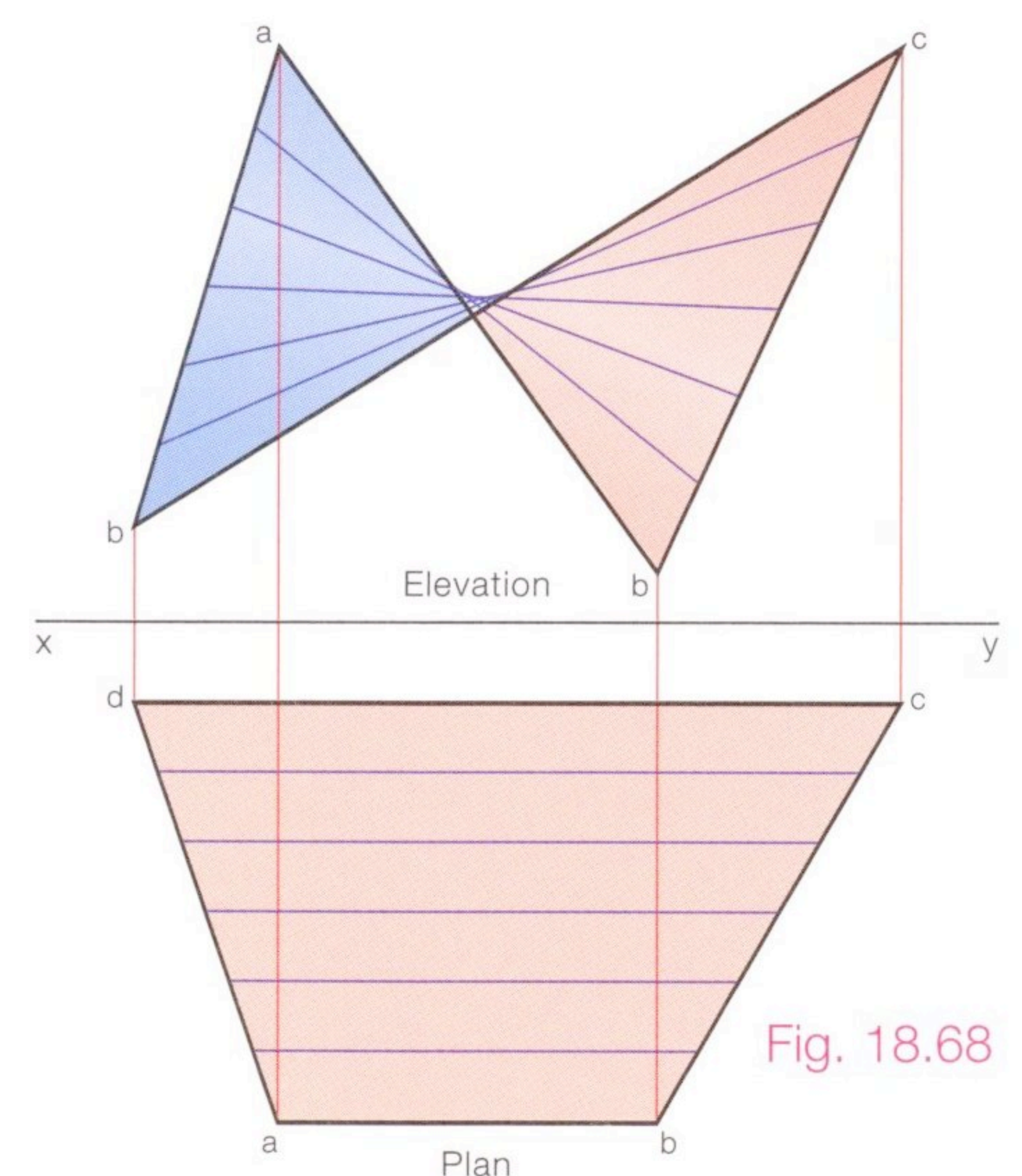


Fig. 18.68

In both Figures 18.68 and Fig. 18.69 the elements of the structure appear parallel either in plan or elevation. If the plane director is an oblique plane, the elements will not appear parallel in either of these views and the use of an auxiliary view is required.



**Generatrices ab and cd**

- 

[illegible]

Fig. 18.70

- There is an infinite number of plane directors for any hyperbolic paraboloid surface. They will all be parallel to each other but their position can vary.



Given two skew line directrices  $ab$  and  $cd$  and the traces of the plane director of a hyperbolic paraboloid. To determine the elements of the surface.

$$a = 30, 10, 68$$

$$b = 75, 21, 40$$

$$c = 18, 45, 10$$

$$d = 82, 9, 27$$

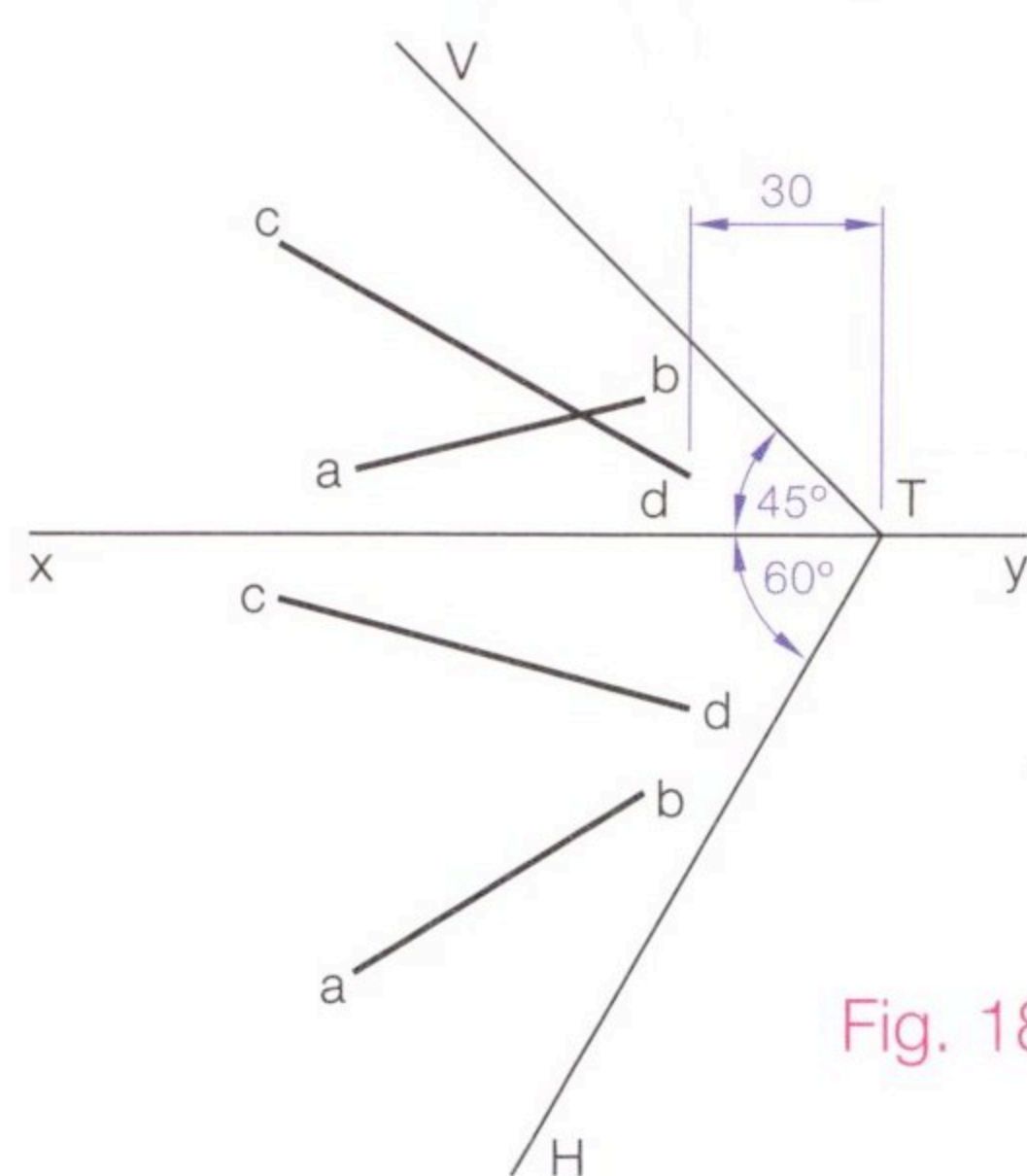


Fig. 18.72

- (1) Find the edge view of the plane director by projecting an auxiliary view in the direction of the horizontal trace.
- (2) Draw the directrices  $ab$  and  $cd$  in this auxiliary.
- (3) The elements can now be drawn in the auxiliary, parallel to the edge view of the plane director. The most extreme elements are found first and further elements spaced out evenly between these.
- (4) Project the elements back to plan and project to elevation.

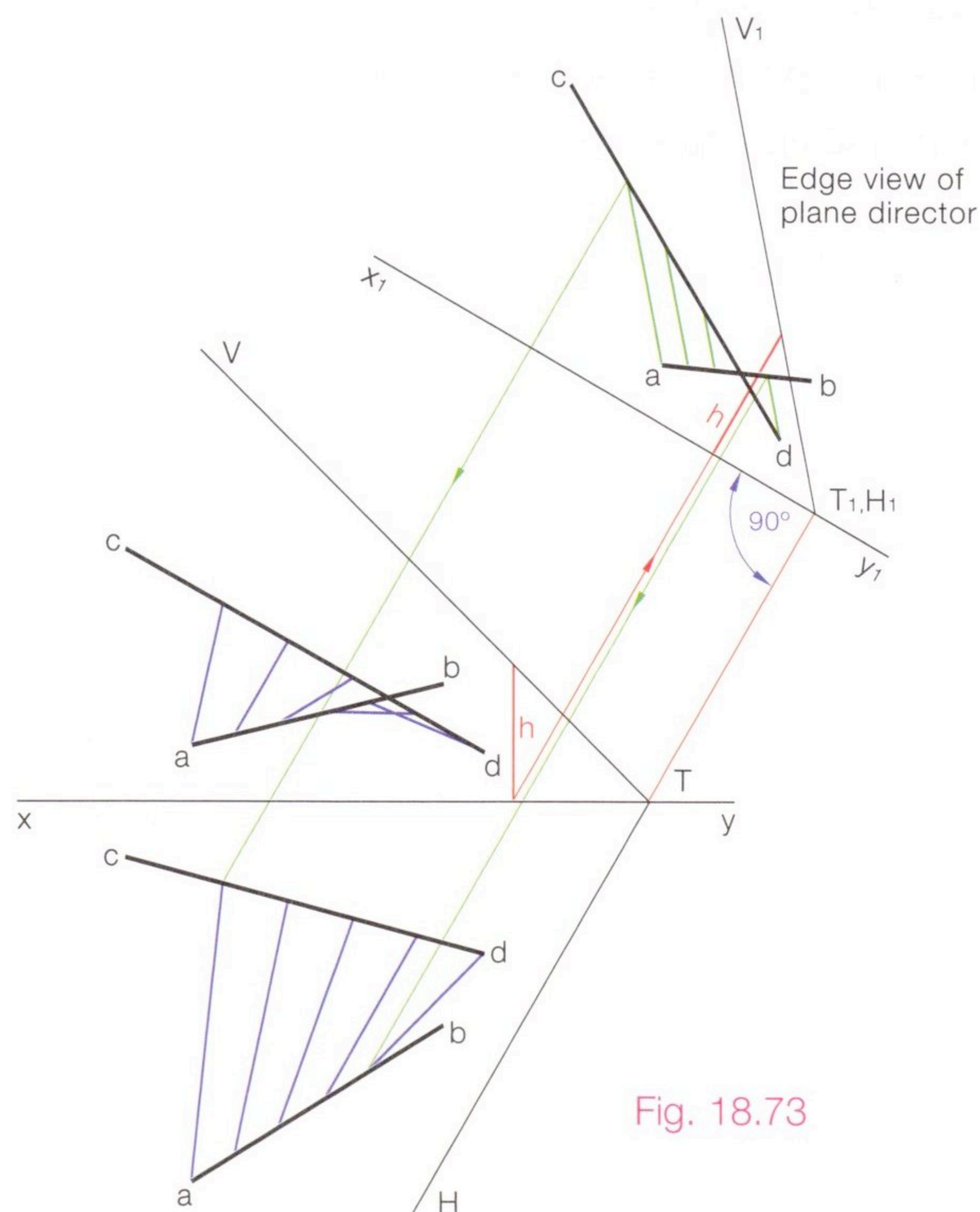


Fig. 18.73





- (i) Draw the plan and elevation of the surfaces ghao, abco and cdeo.
- (ii) Find the curvature of the roof along the line joining b to e.
- (iii) Find the traces of the plane director for the edges ab and co and having its horizontal trace containing point b.

Fig. 18.74



- (6) Point 'a' which is also on the plane director is used to find the vertical trace.