The plan and incomplete elevation of two ducts intersecting is shown. One duct is circular in cross-section, while the other is square in cross-section, see Fig. 20.31.

(i) Find the line of intersection between the two ducts and project an end view.

(ii) Develop the surface of the square duct.

Scale 1:5.

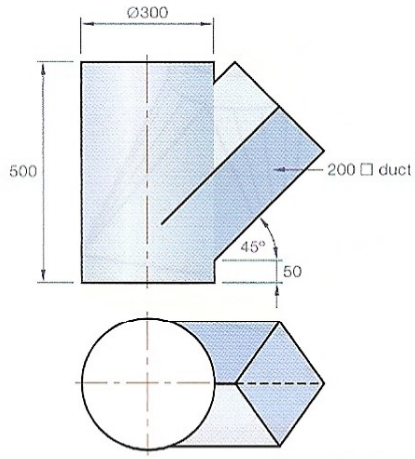


Fig. 20.31

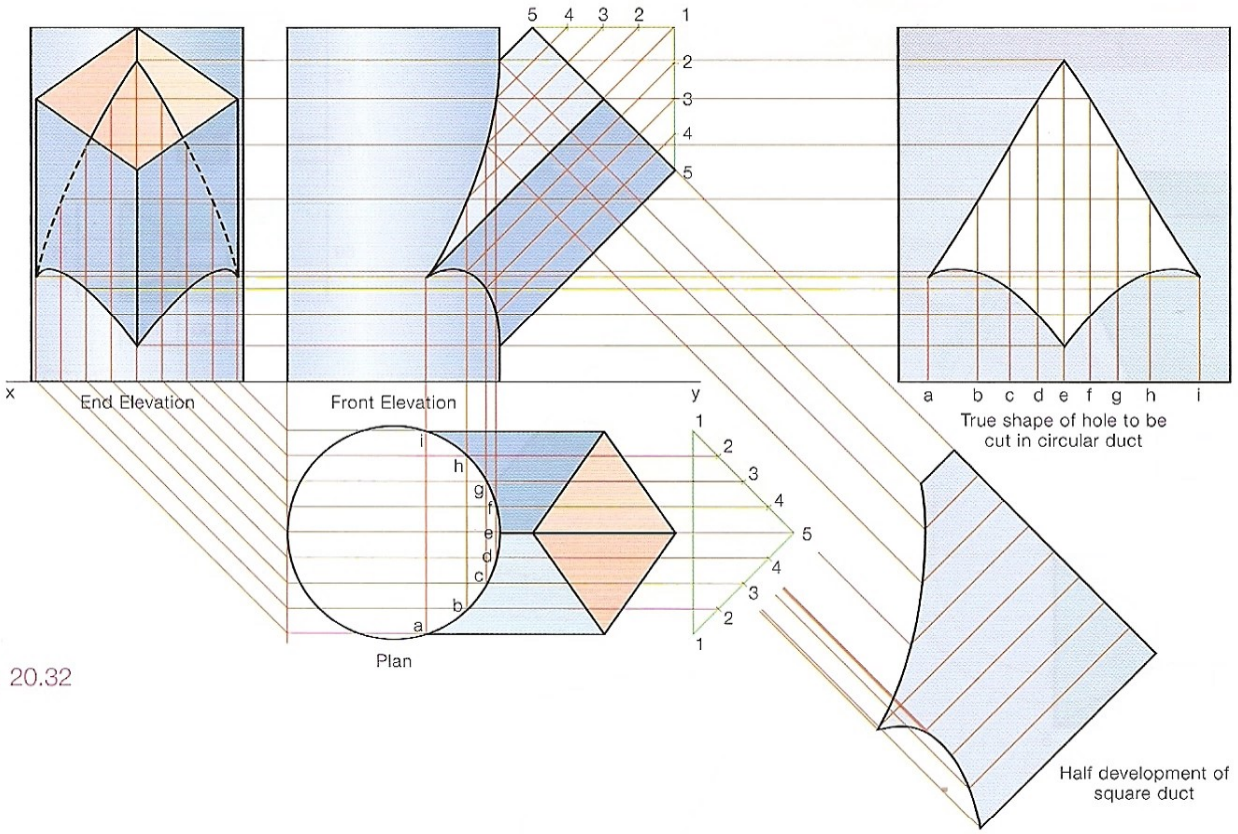


Fig. 20.32

Transition Pieces

A transition piece is one that connects differently shaped openings, differently sized openings and differently angled openings, or any combination of these. In most cases the transition piece is composed of plane surfaces and conical surfaces. Transition pieces are widely used in ducting systems used in ventilation, heating, air conditioning etc.

The development of transition pieces is done by triangulation. This is simply a method of dividing a surface into a number of triangles and using these triangles to build up the development. Triangles are used because if its sides are of a given length, it can only be one shape. A triangle can also be easily reproduced by using the compass.

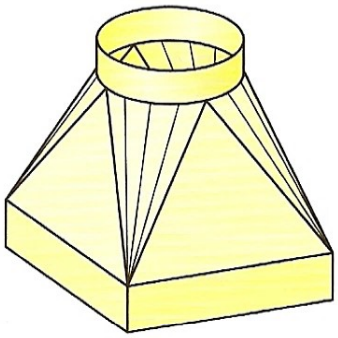


Fig. 20.33a

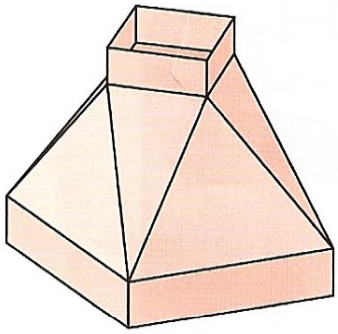


Fig. 20.33b

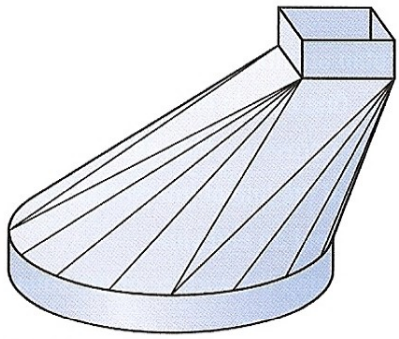


Fig. 20.33c

To determine the development of a funnel piece between two rectangular ducting pieces, see Fig. 20.34.

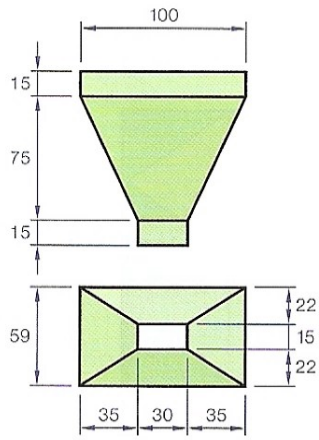


Fig. 20.34

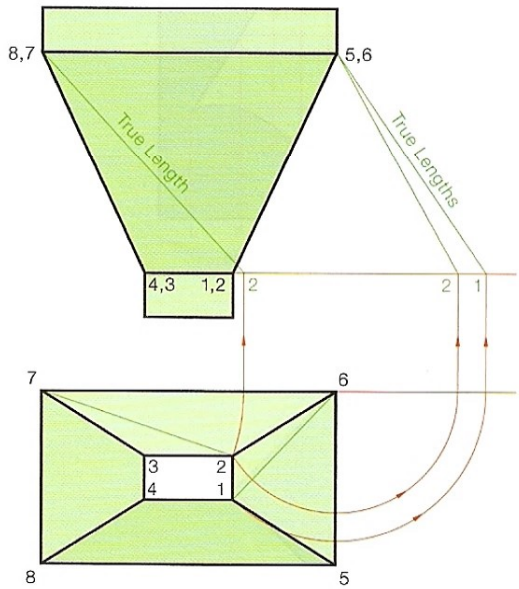
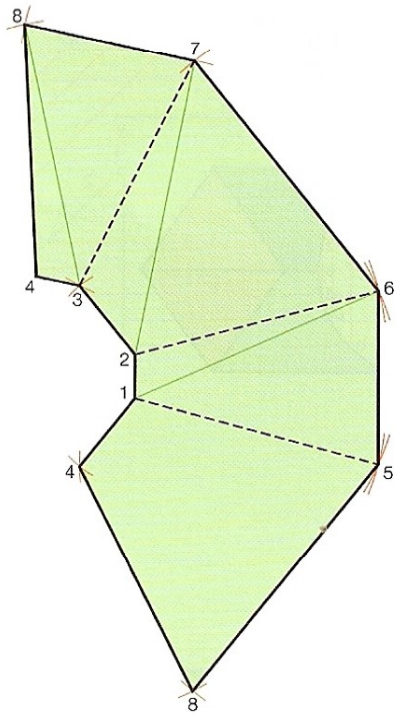


Fig. 20.35



(1) Draw the plan and elevation as given. Index the corners.

(2) Find the true length of the sloping edges. In the diagram we find the true length of 2,6 by rotating point 2 about corner 6 until the line appears horizontal in plan. This line when projected to elevation will appear as a true length.

(3) Edges 1,5 and 4,8 and 3,7 will be equal in length to 2,6.

(4) Start the development with edge 1,2 which is a true length in plan.

(5) With the true length of 2,6 and centre 2 swing an arc.

(6) With true length of diagonal 1,6 and centre 1 swing another arc. The two arcs cross locating point 6.

(7) Point 5 is found using the true length of 5,6 (from plan) and the true length of 1,5 (equal to 2,6).

(8) The complete development is built up using triangulation in this way. As a check on the development, lines parallel on the surface must also be parallel on the development. Edge 1,2 must be parallel to edge 5,6 on the development.

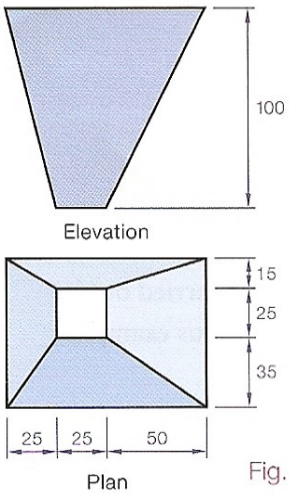


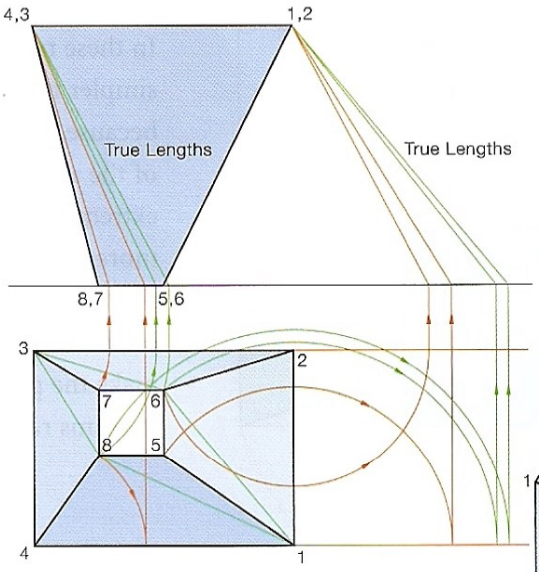
Fig. 20.36

Given the plan and elevation of a sheet, metal hopper. Find the complete development of the surfaces. Fig. 36

(1) Draw the given plan and elevation. Index all corners.

(2) All horizontal edges appear as true lengths in plan. The true length of the sloping edges and the diagonals must be found.

(3) Start the development with one of the top edges of the hopper, e.g. 1,4.



(4) Find the corner 8 next by swinging the true length of diagonal 1,8 from point 1, and by swinging a second arc, the true length, of 4,8 from corner 4.

(5) All other points are found using triangulation and the true lengths found in elevation.

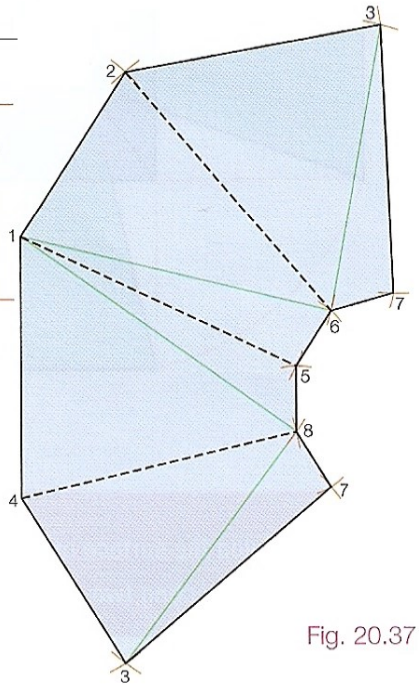
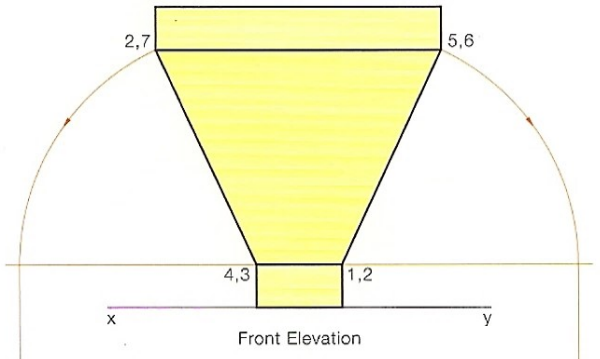


Fig. 20.37

Alternative Method

The two previous examples can be developed using rebattment.



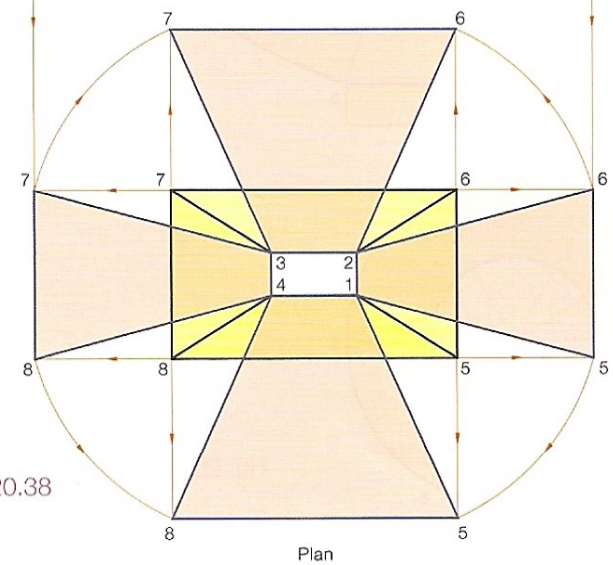


Fig. 20.38

Using the same measurements as in Fig. 20.36 find the development of the funnel piece using rebattment.

(1) The two sides 3,4,8,7 and 1,2,6,5 are folded down in elevation and projected to plan.

(2) The development of these two sides can be found in plan.

(3) The other two sides are found by using the information that the seam length must be equal for two adjoining edges.

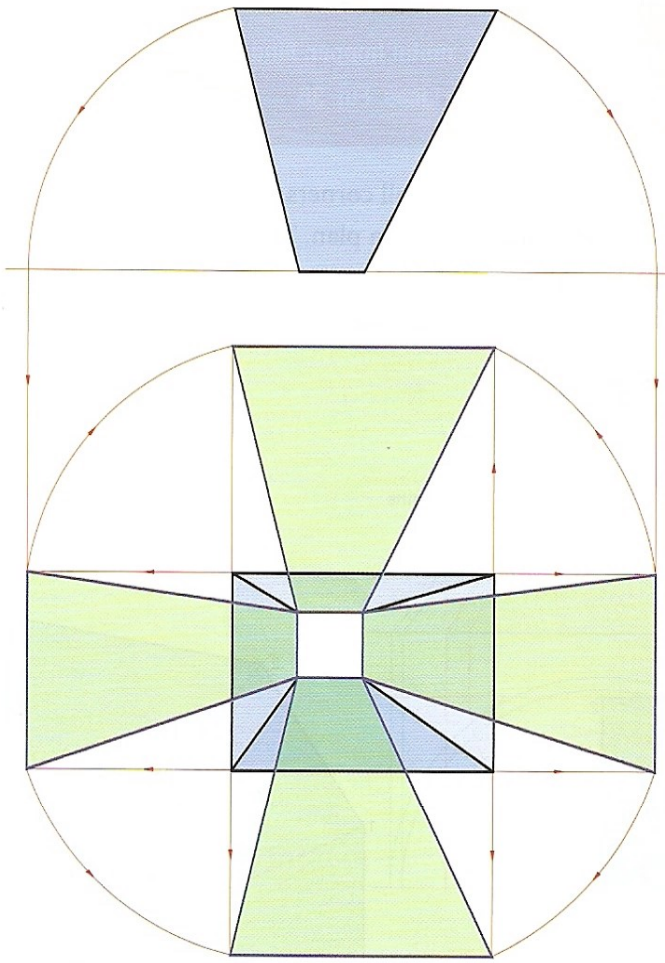


Fig. 20.39

Using the same measurements as in Fig. 20.36, find the development of the hopper using the rebattment method.

The construction of the solution is carried out in exactly the same way as in the previous example.

In these two examples the rebattment method is a simpler method than the triangulation method. This is because in both cases we already had edge views of two of the sides in elevation which made their rebattment extremely easy. The triangulation method may appear more complex but is much more versatile and also produces a development pattern having all sides connected in a continuous sheet. This, of course, would make the production of the object a matter of bending at seams rather than joining at seams.

To develop the surface of a transition piece connecting two circular pipes.

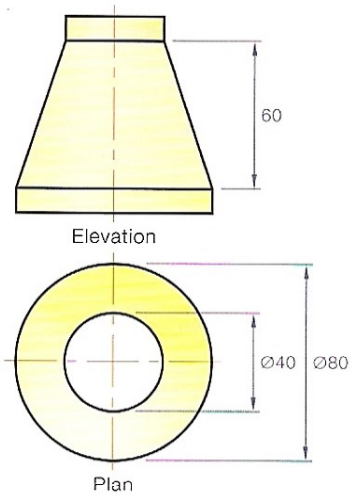


Fig. 20.40

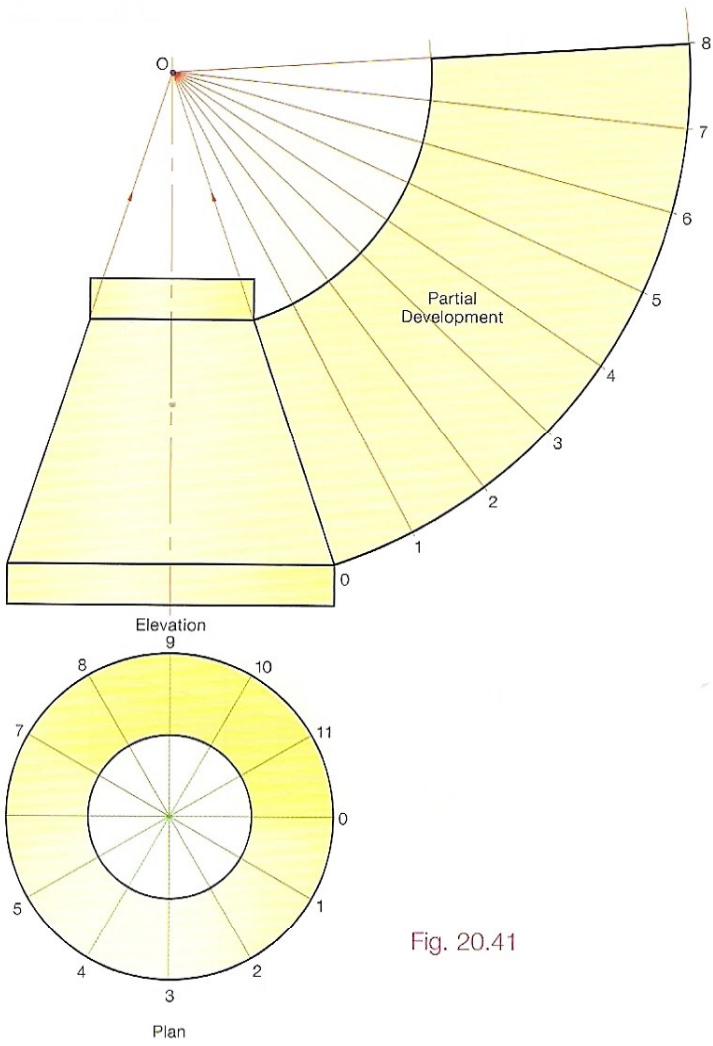


Fig. 20.41

(1) The centres of the inlet and outlet pipes lie on the same axis and therefore the transition piece will be conical. The sides of the elevation are extended to meet, giving the apex of this conical piece.

(2) The development is now completed as for a truncated cone. Divide the plan into twelve equal divisions. In elevation, having centre at O, the apex, swing an arc from the top and bottom of the truncated cone.

(3) Step-off the twelve equal divisions from plan around this arc. Join these points to the apex to complete the development.

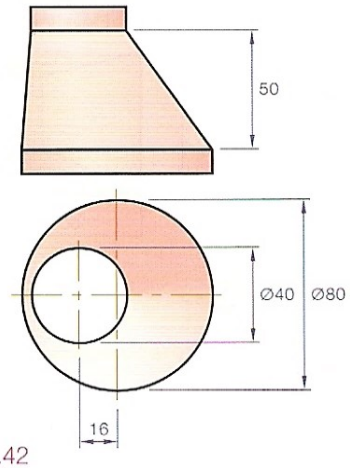


Fig. 20.42

To develop the surface of a transition piece connecting two circular pipes whose axes are not aligned, see Fig. 20.42.

Even though the transition piece may look like an oblique cone it can be shown that generators on its surface do not meet at a single point when extended. The surface is warped and can only be developed approximately by triangulation.

(1) Draw the plan and elevation and divide both circles into 12 equal parts.

(2) Draw the generators in plan and elevation.

(3) Draw the diagonals which will divide the surface into triangles.

(4) The true lengths of the twelve generators and the twelve diagonals must now be found and are probably best found on a separate diagram.

(5) The development may now be built up using the true lengths and the compass as explained before.

Note: The true lengths of the generators and the diagonals are found on separate diagrams for clarity. In each case the true length is found by using the apparent length of the line in plan and the height of the line in elevation to create a right-angled triangle. The hypotenuse of the triangle is the true length.

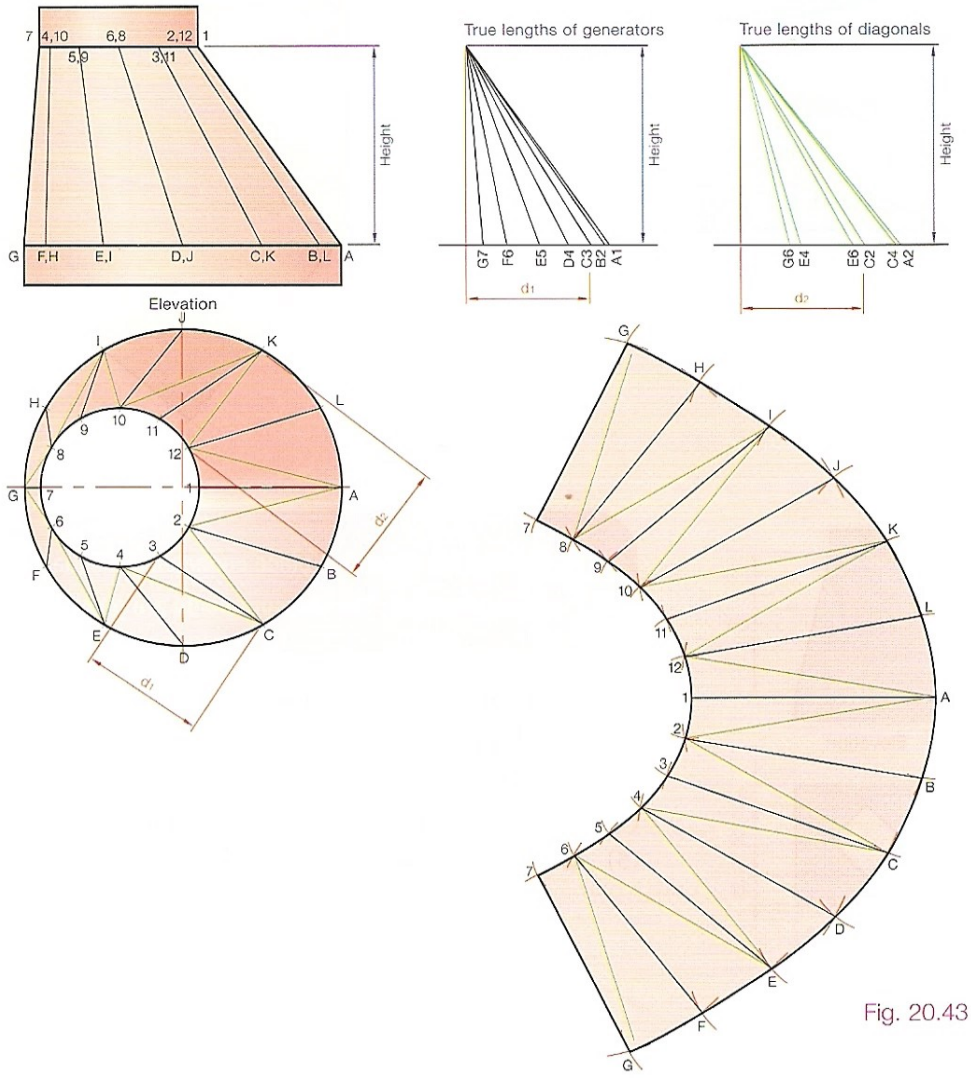


Fig. 20.43

To develop the surface of the transition piece connecting ducting of square section and rectangular section, see Fig. 20.44.

This development could be solved by rebattment or by triangulation. It will be solved by triangulation in this example.
When finding the true lengths, care must be taken that the correct heights are used.

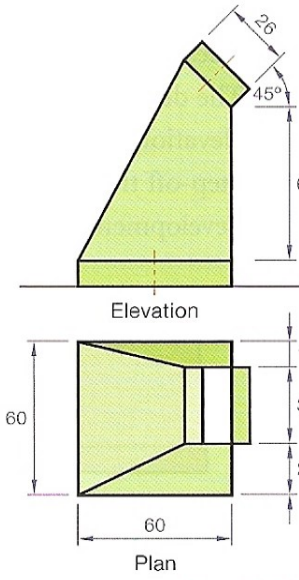


Fig. 20.44

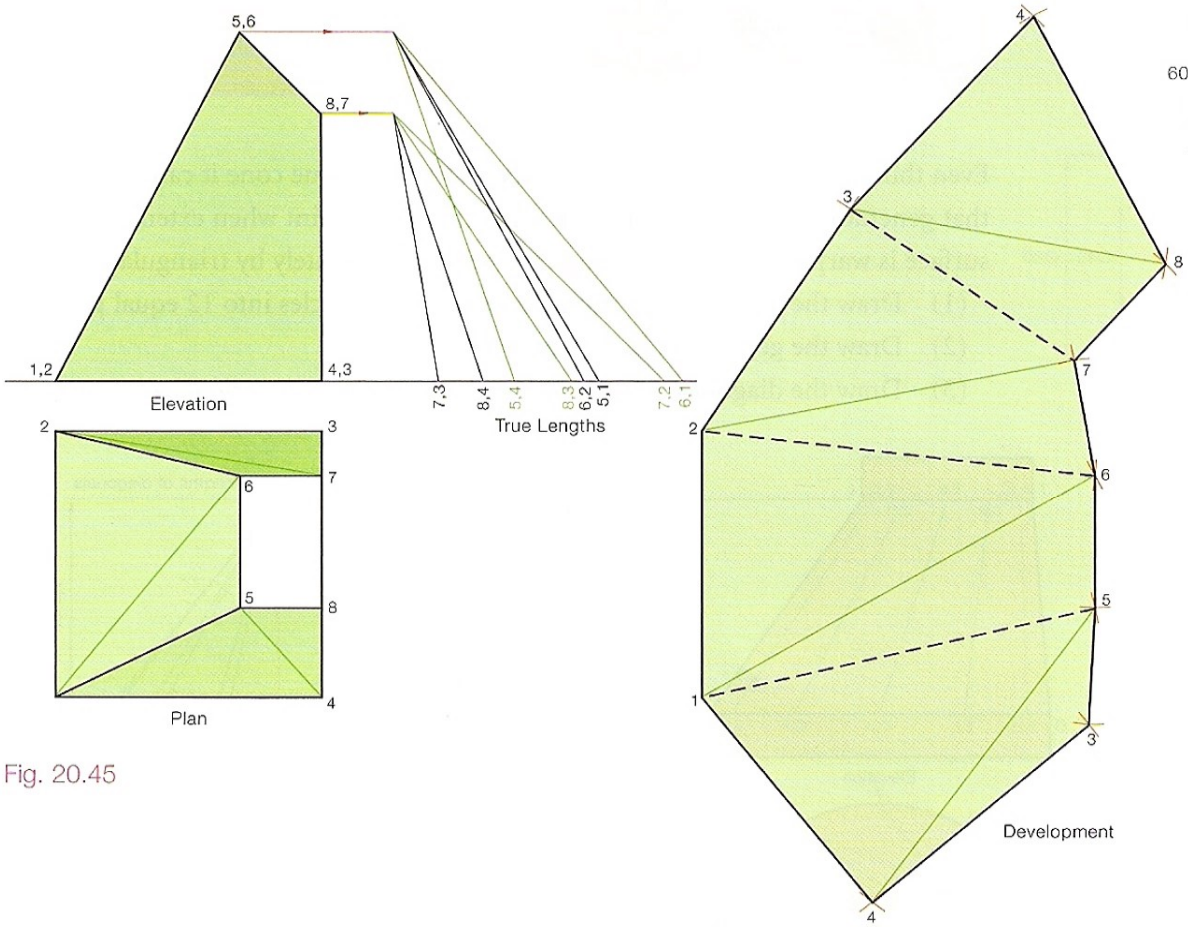


Fig. 20.45

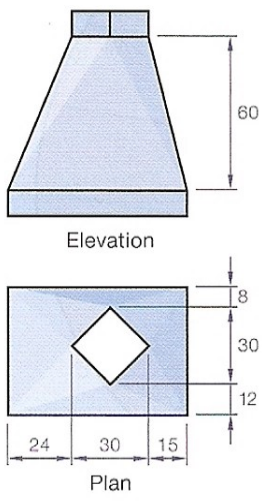


Fig. 20.46

To develop the transition piece connecting a square duct and a rectangular duct. The measurements are given in Fig. 20.46.

(1) Draw the given plan and elevation.
(2) Divide the surface into triangles.
(3) Index the corners.
(4) Find the true lengths of all edges of these triangles.
(5) Complete the development in the usual way.