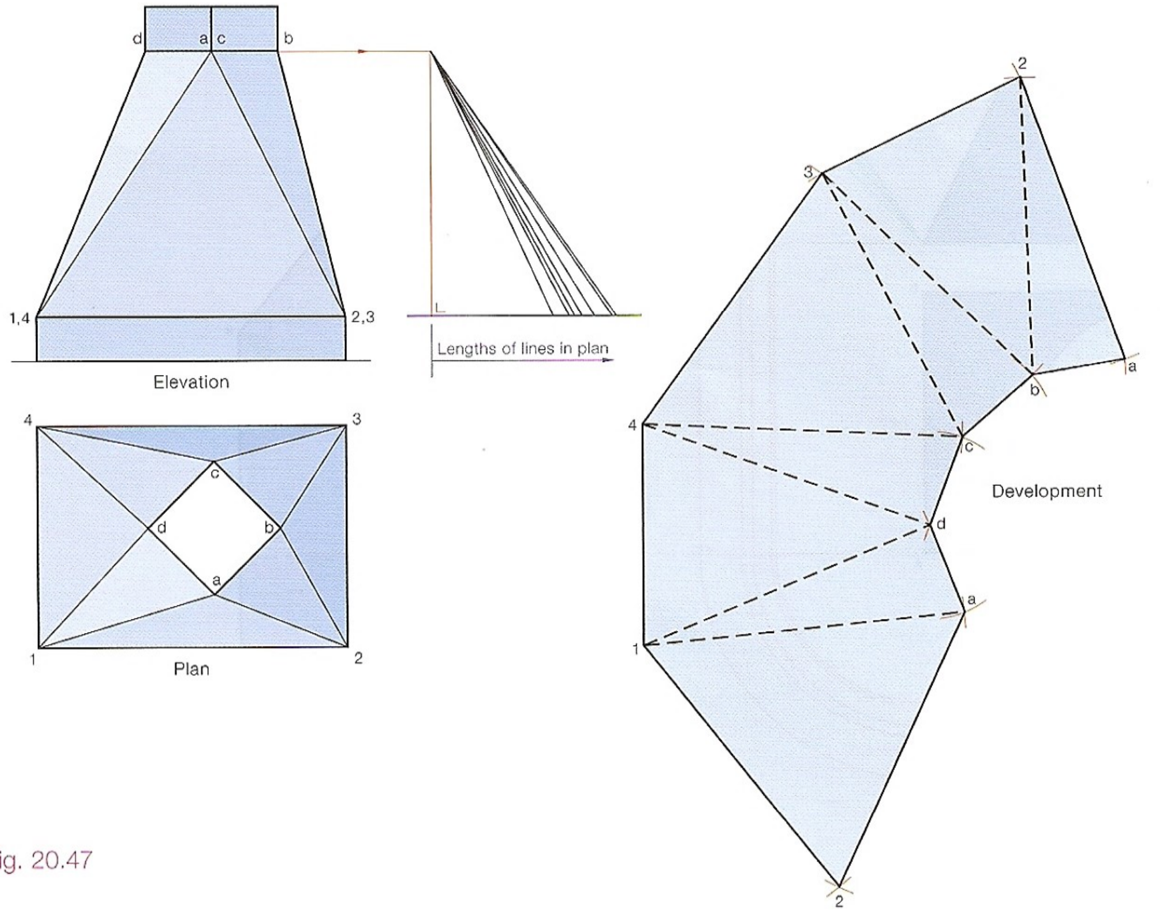


Fig. 20.47

Transition Pieces: Circular to Rectilinear

To find the development of a transition piece connecting a circular pipe and a rectangular pipe on the same axis, Fig. 20.48.

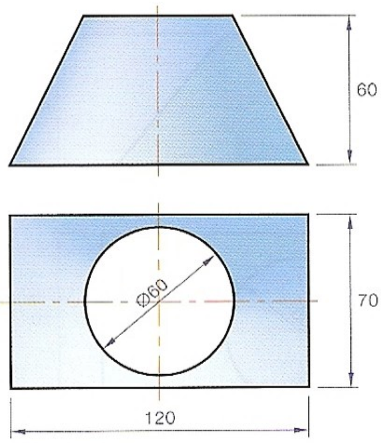


Fig. 20.48

The transition piece is composed of four isosceles triangles and four conical surfaces. The conical surfaces are subdivided into small triangular portions and the complete development is completed by triangulation.

(1) Divide the circle into equal divisions.
(2) Join the corners to the divisions thus forming the triangles that can be developed.
(3) Find the true lengths of lines a1, a2, a3, a4 and a5 by rotation in plan.
(4) The transition piece is symmetrical and therefore these true lengths can be used for the other three corners.
(5) Start with the isosceles triangle a1d. The length of ad is seen in plan and the true length of a1 is used to form the triangle.
(6) From point 1 on the development swing an arc equal in length to one of the divisions on the circle. From point 'a' on the development swing an arc equal to the length of a2. The two arcs cross, locating point 2 on the development.
(7) Build up the development in this way.
(8) The smaller the triangles are made on the transition piece the more accurate the development.

HIGHER LEVEL

HIGHER LEVEL

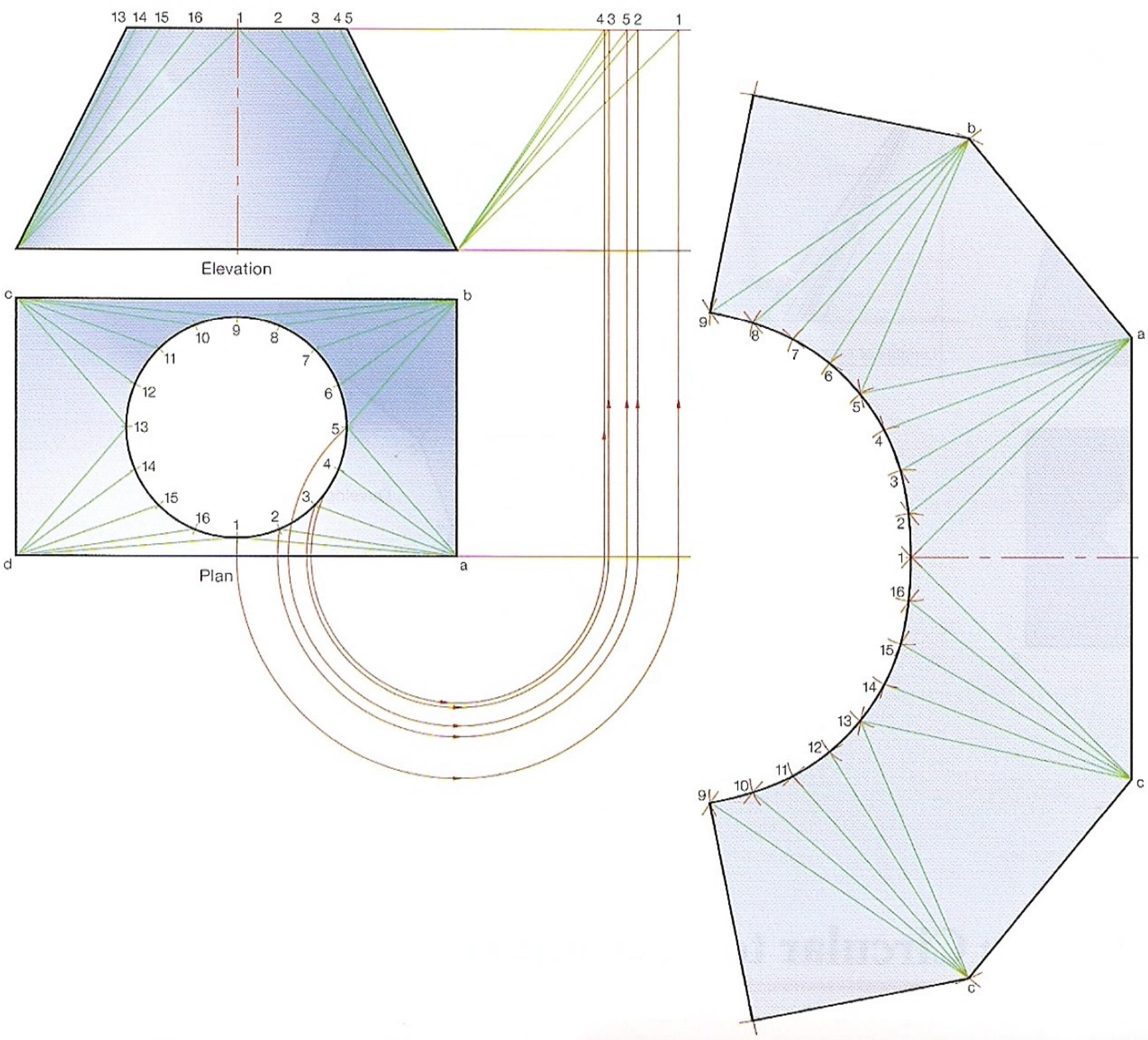


Fig. 20.49

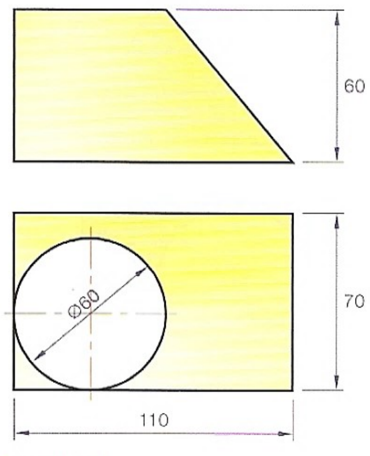


Fig. 20.50

Fig. 20.50 shows a transition piece starting as a rectangle and ending as a circle. The circle is off-centre. Show the complete surface development of the surface of the transition piece.

The procedure is the same as in the previous example but is made more complex because the circle is off-centre. There are many more true lengths to be found. It should be noted that A1 and B1 will

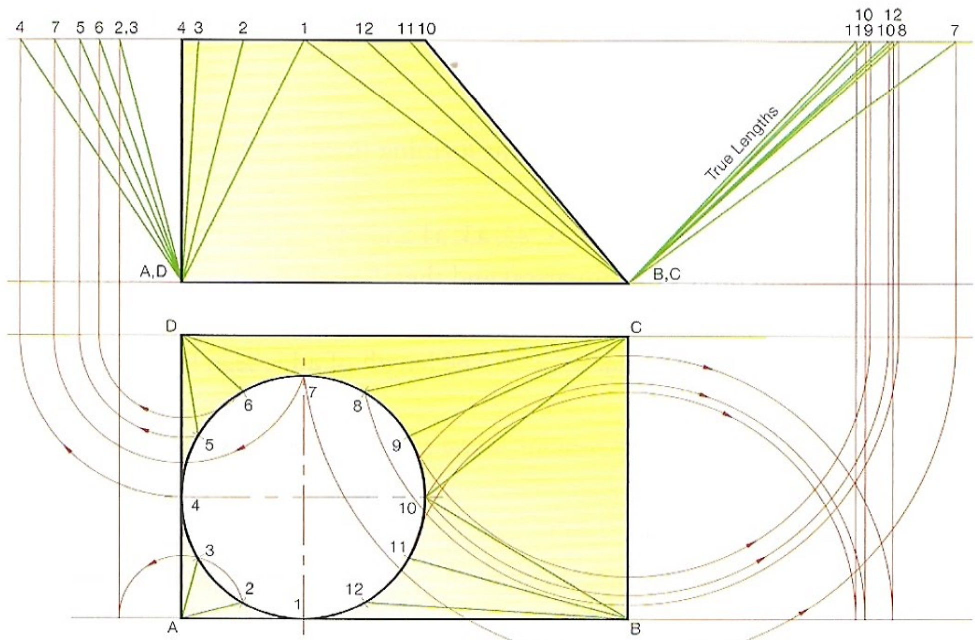


Fig. 20.51

appear as true lengths in the front elevation. Elements A1 and A4 will be the same length, as will elements A2 and A3. Proper indexing is important to help keep track of which distances need to be taken.

(1) Divide the circle into a number of divisions.
(2) Divide the surface into triangles.
(3) Start with one of the larger triangles, e.g. B,C,10.
(4) Using the divisions from the circle and the appropriate true length the development is built up as before.

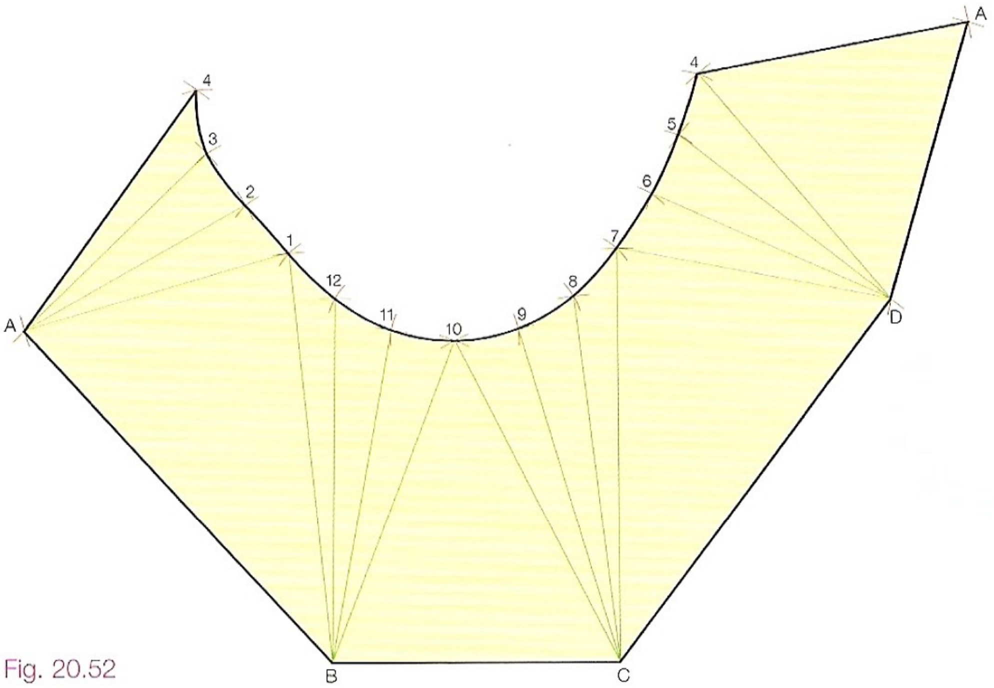


Fig. 20.52

Fig. 20.52 shows a transition piece joining a square duct to a circular duct. The ducts lie on different axes. Make a development of the transition piece.

The true shape of the seam joining the transition piece and the cylindrical pipe must be found. It will be elliptical because the cylindrical pipe is cut at an angle.

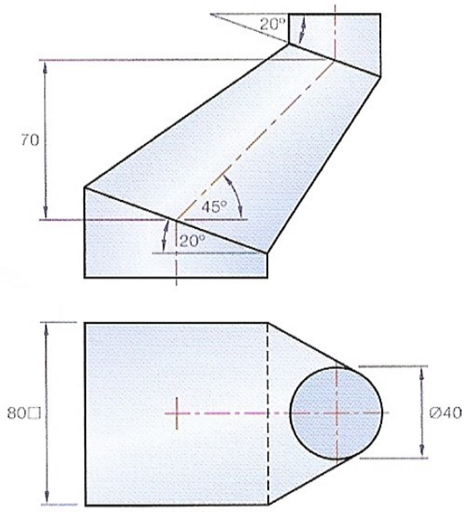


Fig. 20.53a

(1) Divide the circle in plan into a number of equal parts. Project these points to elevation.
(2) Using the 'distances' from the elevation and the divisions on the circle in plan to find the true shape of the joint line.
(3) Divide the transition piece into triangles in the usual way.
(4) Find the true lengths of the elements on the drawing or using a separate diagram as shown here.
(5) The development is done in the usual way ensuring that the distances 1 to 2 and 2 to 3 etc., are taken from the true shape of the joint, the ellipse.

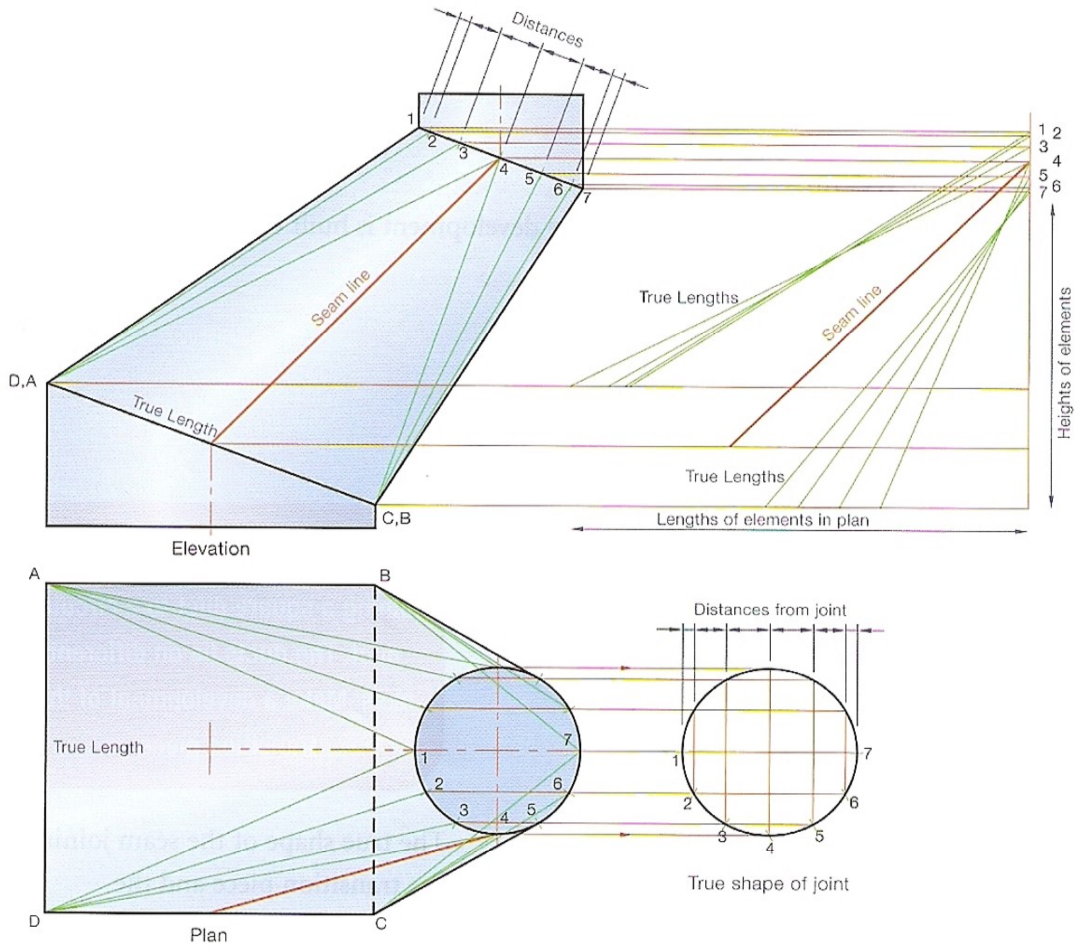


Fig. 20.53b

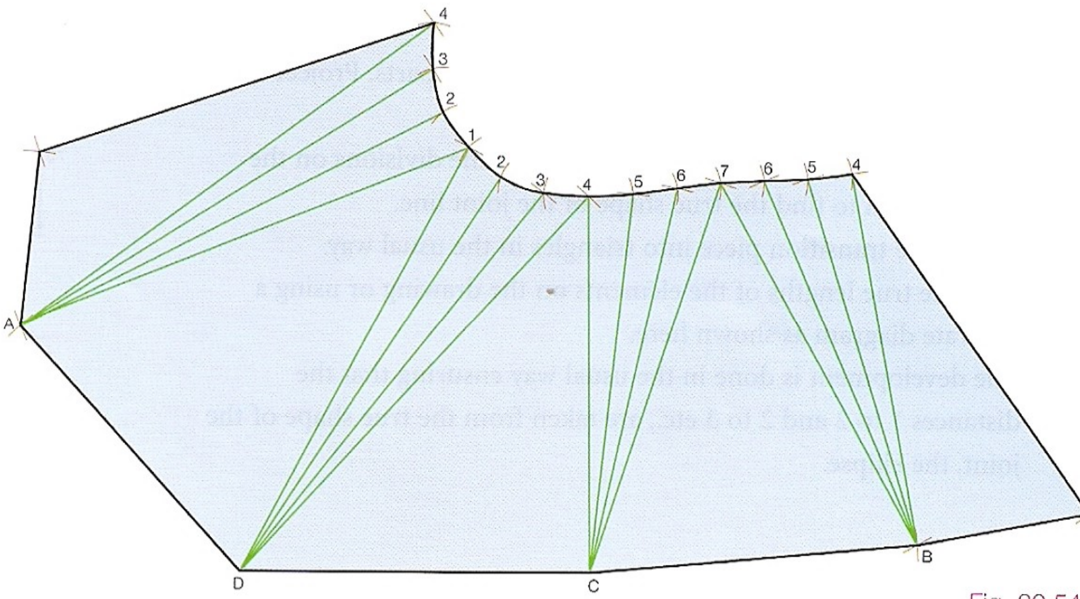


Fig. 20.54

Fig. 20.55 shows a transition piece connecting two cylindrical pipes of different diameters and on different axes. Find a half-development of this transition piece.

This transition piece looks like a frustum of an oblique cone but it is not and must be solved by triangulation. The large pipe is shown full-size in plan and an auxiliary is needed to show the true size of the inclined pipe.

(1) Draw the elevation and use the auxiliary of the small pipe to help draw the ellipse in plan.
(2) Divide up the circles and triangulate half of the transition piece.
(3) Index the sides of the triangles carefully. The true length of each of these lines must be found. Set up a right-angled triangle using the height of the element in elevation and the length of the element in plan. The hypotenuse of this triangle gives the true length.
(4) Construct the development as before.

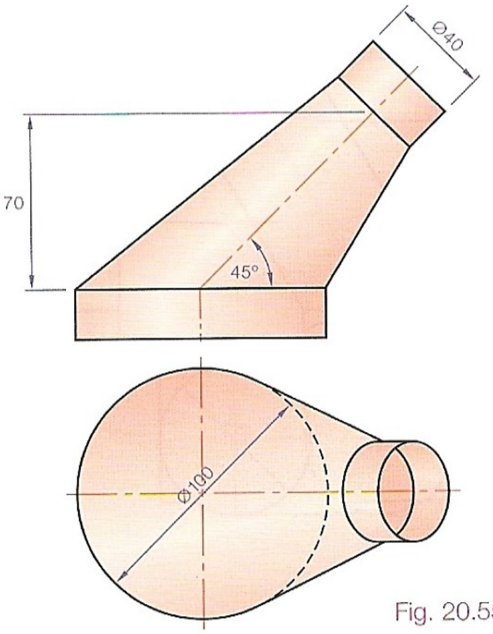


Fig. 20.55

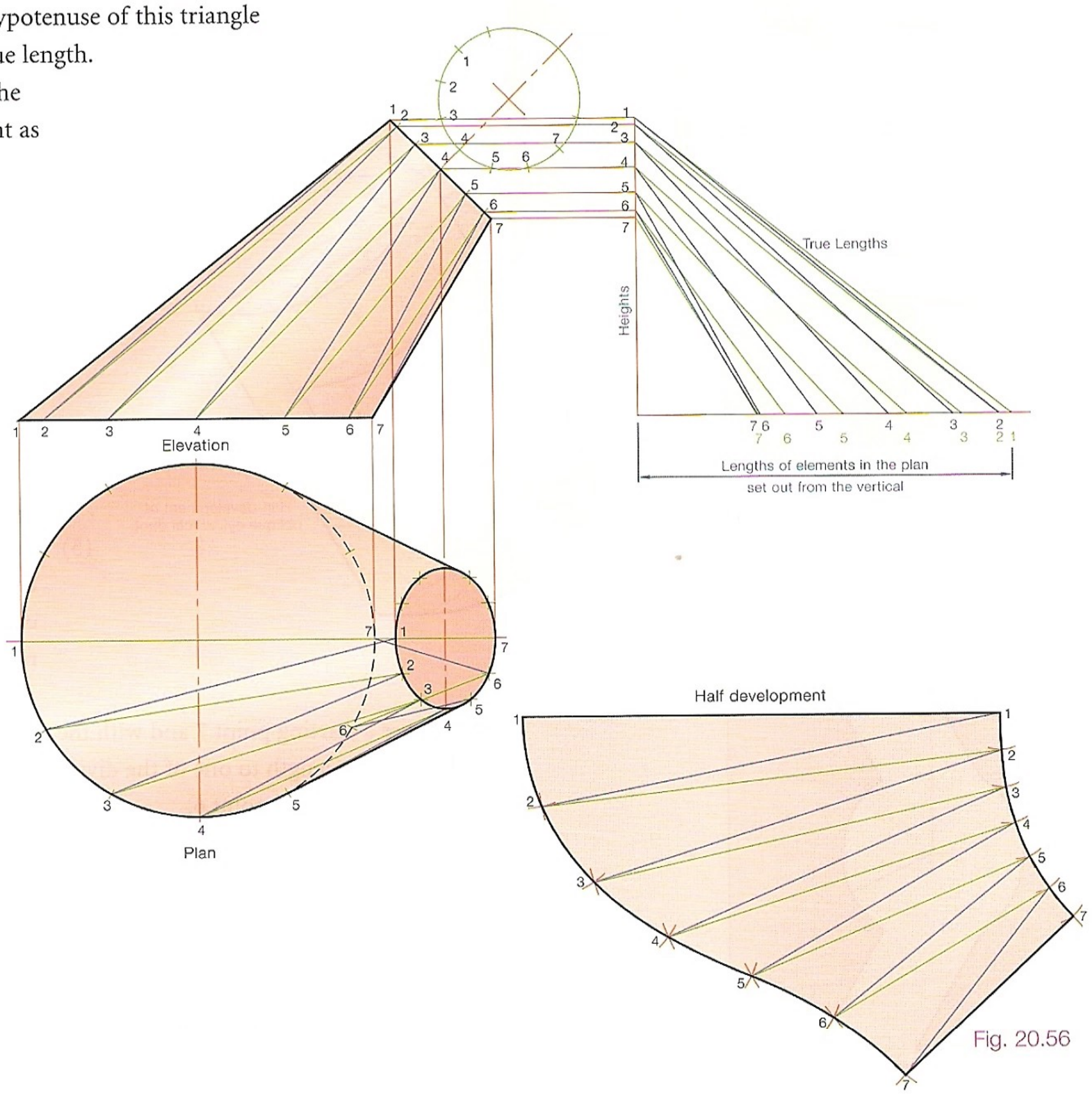


Fig. 20.56

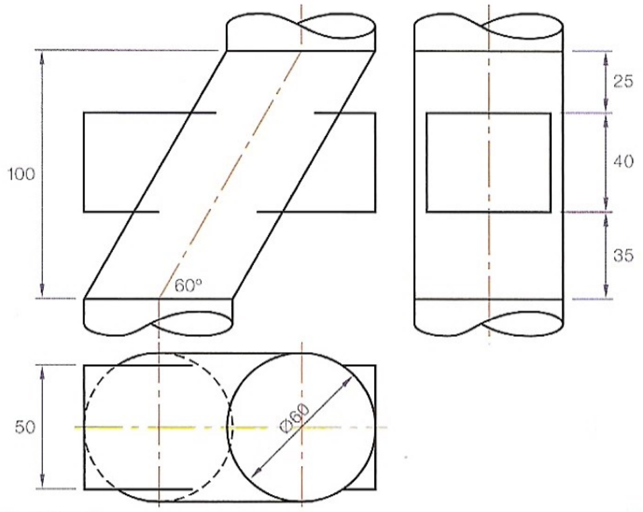


Fig. 20.57

Fig. 20.57 shows a rectangular duct intersecting with an oblique cylindrical section of ductwork.

(i) Find the line of intersection between the ducting systems.

(ii) Find the complete surface development of the rectangular duct.

(iii) Make a half-development of the oblique cylindrical duct.

(1) Remembering that horizontal sections of an oblique cylinder give circles, it can be deduced that the joint lines on the top and bottom surfaces of the rectangular duct will be portions of such circles.

(2) The joint lines on the side of the rectangular duct will be straight lines running parallel to the cylinder axis.

(3) The development of the rectangular duct is equally straightforward as the true shapes of the top and bottom surfaces are seen in plan and the true shape of the sides are seen in the front elevation.

(4) The oblique cylinder is developed as described earlier in this textbook. Divide the circle in plan into 12 equal parts and draw the elements in elevation.

(5) Project the ends of each element in elevation out at right angles.

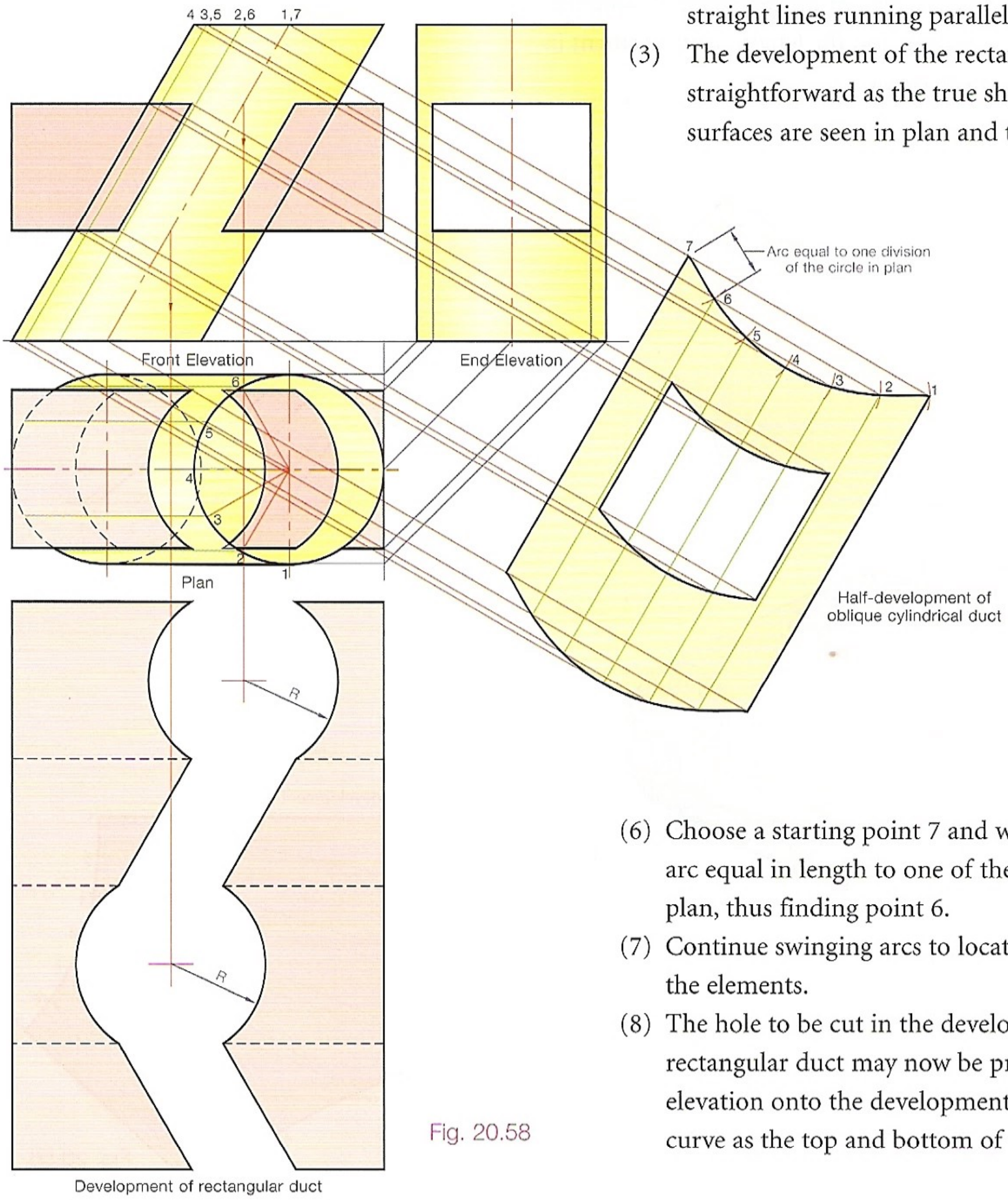


Fig. 20.58

(6) Choose a starting point 7 and with the compass swing an arc equal in length to one of the divisions from the circle in plan, thus finding point 6.

(7) Continue swinging arcs to locate further points and draw in the elements.

(8) The hole to be cut in the development to accommodate the rectangular duct may now be projected from the front elevation onto the development. It will follow the same curve as the top and bottom of the development.

Fig. 20.59 shows a square duct intersecting with an oblique cylindrical section of ductwork.

(i) Draw the given views and project a plan.

(ii) Show the line of intersection in all views.

(iii) Develop the surface of the square ducting section A.

(iv) Develop the surface of the oblique cylindrical duct.

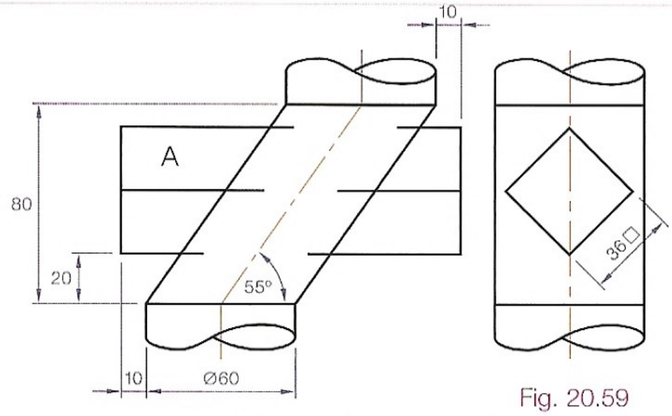


Fig. 20.59

(1) The joint lines must be found first. Divide one circle in the plan into equal divisions, and from these divisions draw elements along the surface of the cylinder. Find these elements in all three views.

(2) Where the elements cross the square duct in end view locates points on the joint line.

(3) The corner 'c' can be located as shown. An element is drawn in the corner in plan to the top circle. This element is located in elevation and 'c' is projected up onto this line.

(4) The development of section A of the square duct is projected down from the front elevation. The distances between the lines in the development are taken from the end view.

(5) The oblique cylinder is developed as before with special attention being given to corner 'c'.

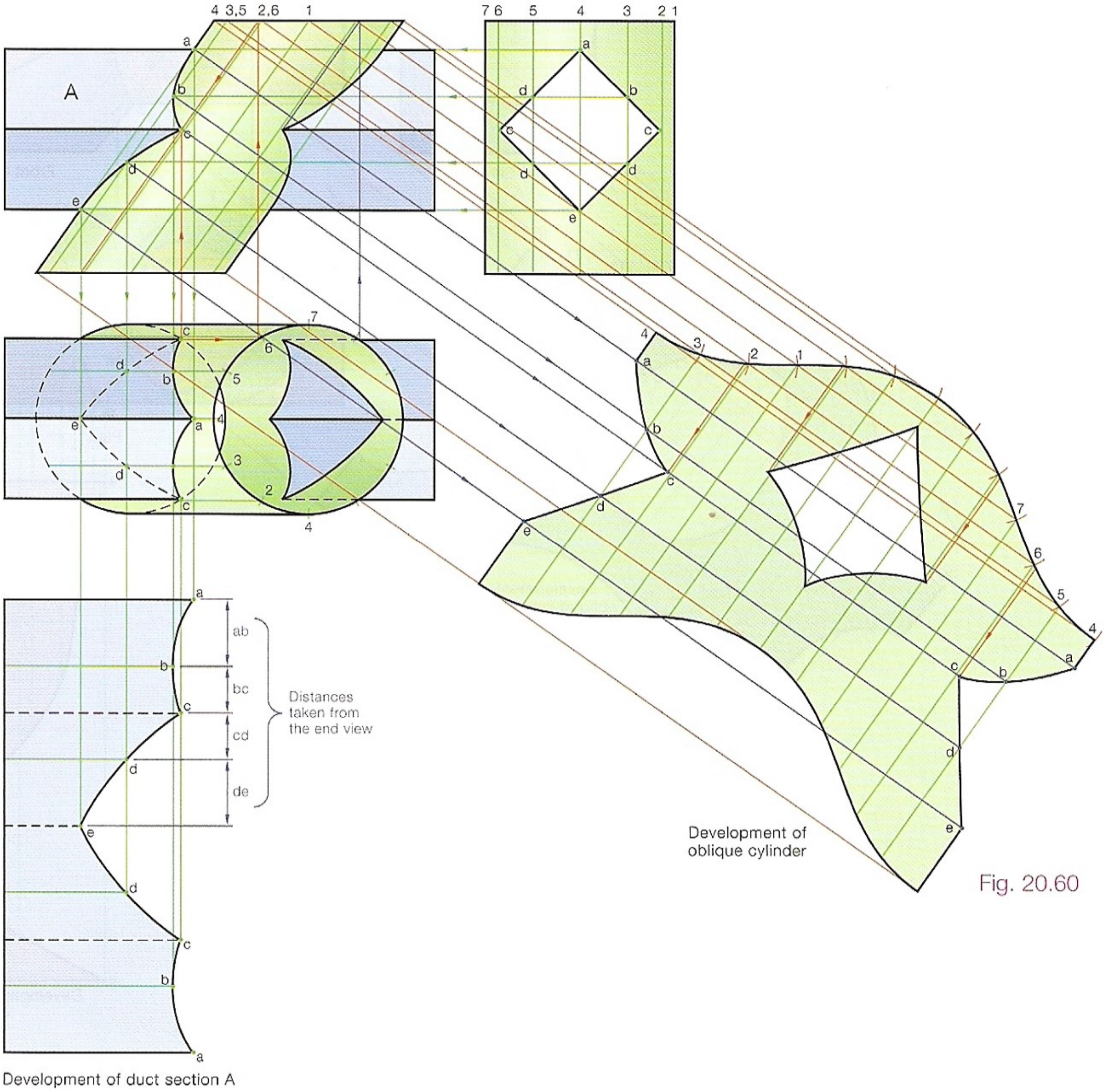


Fig. 20.60

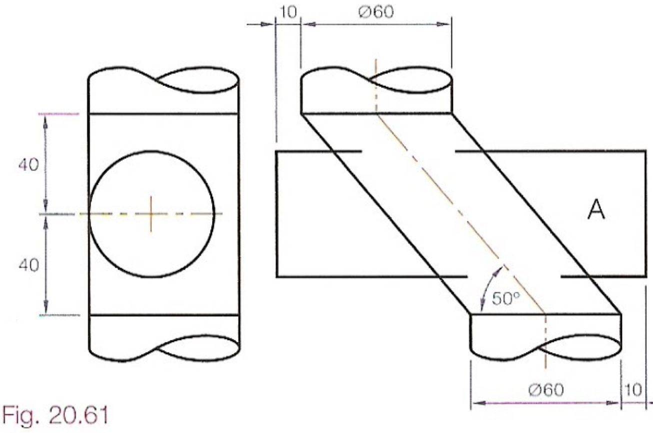


Fig. 20.61

Fig. 20.61 shows a cylindrical duct intersecting an oblique cylindrical duct. The cylindrical duct is off-centre.

(i) Draw the given views and project a plan.

(ii) Find the joint line in all views.

(iii) Develop section A of the cylindrical duct.

(iv) Develop the oblique cylindrical duct.

The development of the oblique cylinder is carried out in the usual way. The distance 'x' is found in plan and helps to locate the extra element introduced to locate point f.

The spacing of the lines in the development of section A are found using the distances between the points on the circle in end view. The gaps will vary as we move around the circle.

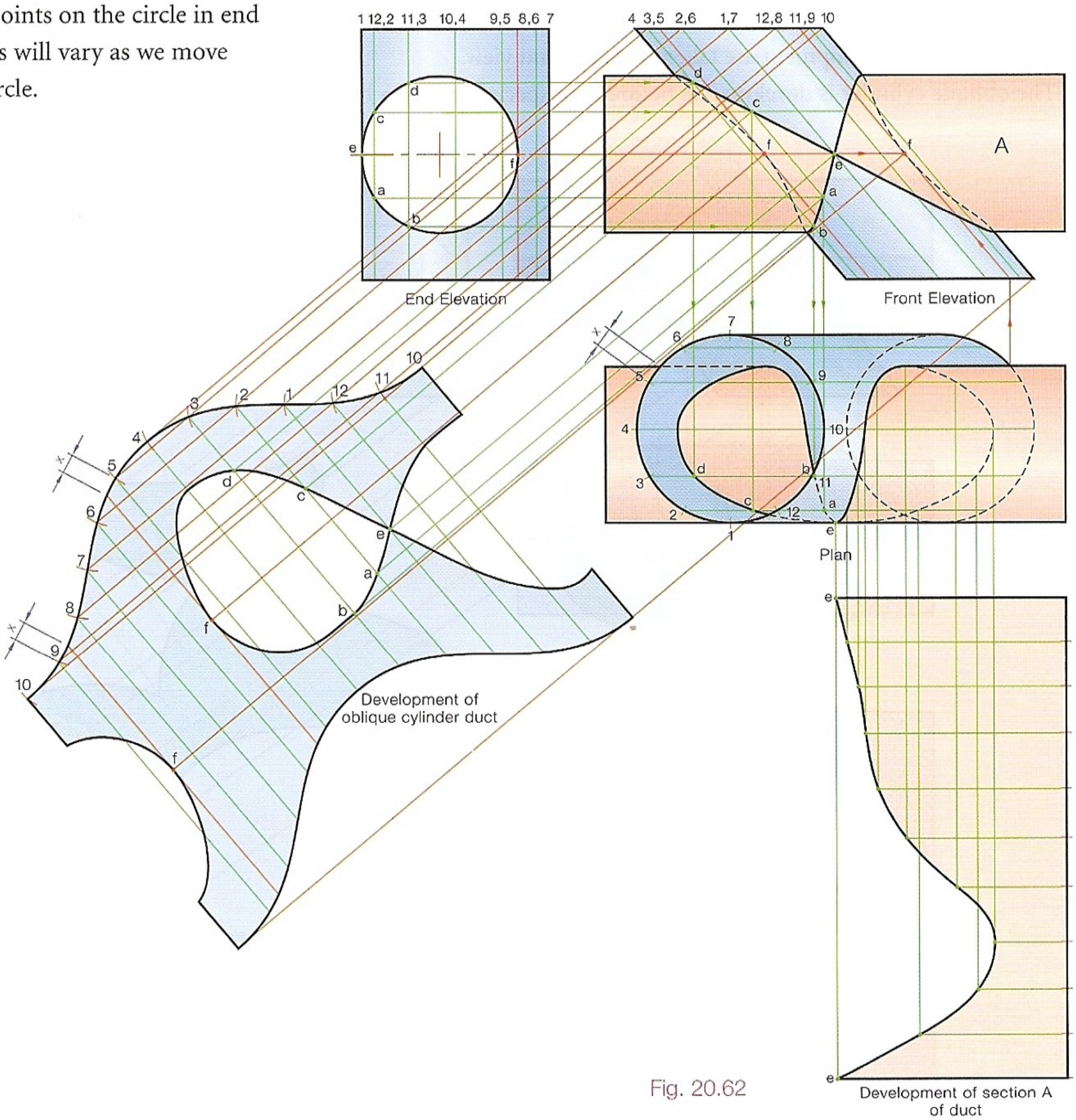


Fig. 20.62

HIGHER LEVEL

HIGHER LEVEL

Fig. 20.63 shows a transition piece which is in the form of a truncated oblique cone. The transition piece is intersected by a square duct as shown.

(i) Draw the given views and project a plan.

(ii) Find the joint line in all views.

(iii) Develop the surface of the transition piece.

(iv) Develop the surface of the square duct.

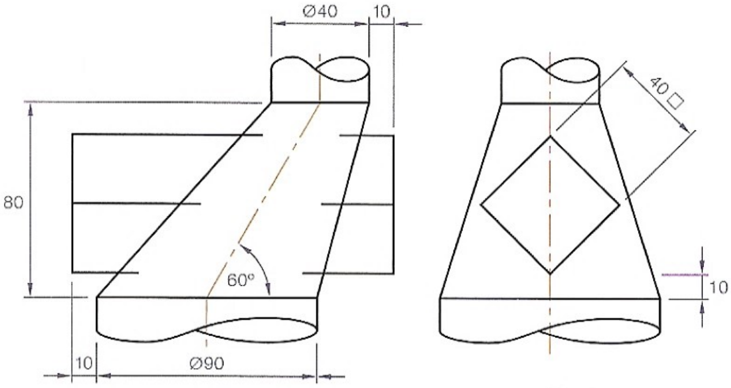
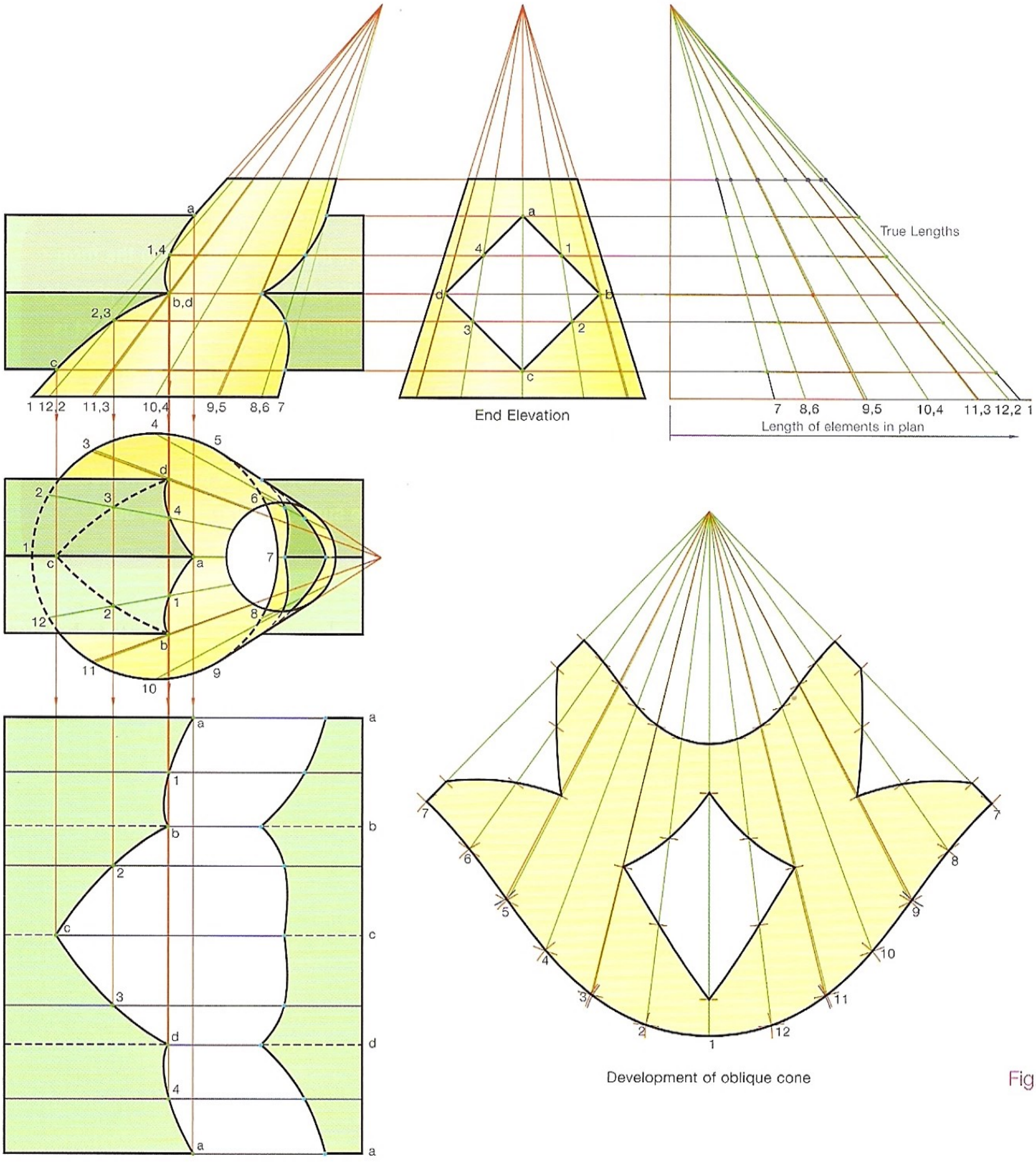


Fig. 20.63



Development of square duct

Fig. 20.64

(1) The transition piece is an oblique cone. Generators along its surface will all meet at one point, the apex of the cone. Divide the large circular duct into 12 equal parts. Draw in the generators and extend them to meet at the cone apex. The generators are used, as before, to find the joint line between the square duct and the transition piece. Points are projected from the end view back to the other views.

(2) The development of the square duct is found in the same way as in the previous examples. The distances between the lines in the development are taken from the end view. The points on the seam are projected down from plan.

(3) The method of developing an oblique cone has been examined earlier. The true length of each generator must be found. A right angle is formed using the length of an element in plan and the height of the same element in elevation. The hypotenuse of this triangle equals the true length of the element.

(4) Choose a location for the apex and draw one of the elements, e.g. element 1. From the bottom of this element swing an arc having a radius equal in length to one of the divisions on the large circle. Using the true length of element 12 draw an arc from the apex to cut the first arc. This locates point 12 on the development. Find the complete development in this way.

(5) The cut-outs from this development are found by stepping true length distances on the generators as shown.

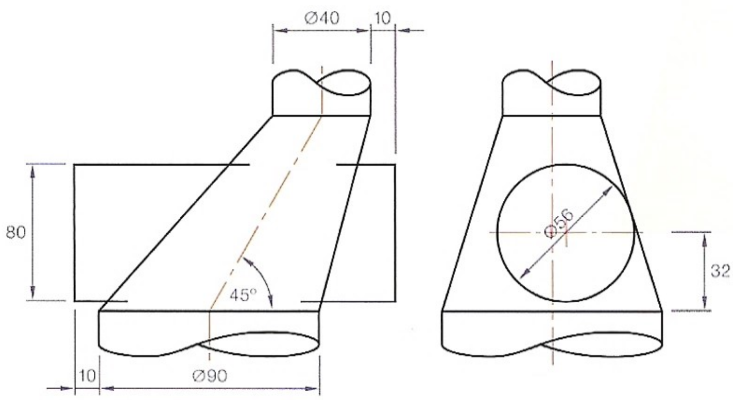


Fig. 20.65

Fig. 20.65 shows a transition which is in the form of a truncated oblique cone. The transition piece is intersected by a circular duct. The circular duct is off-centre.

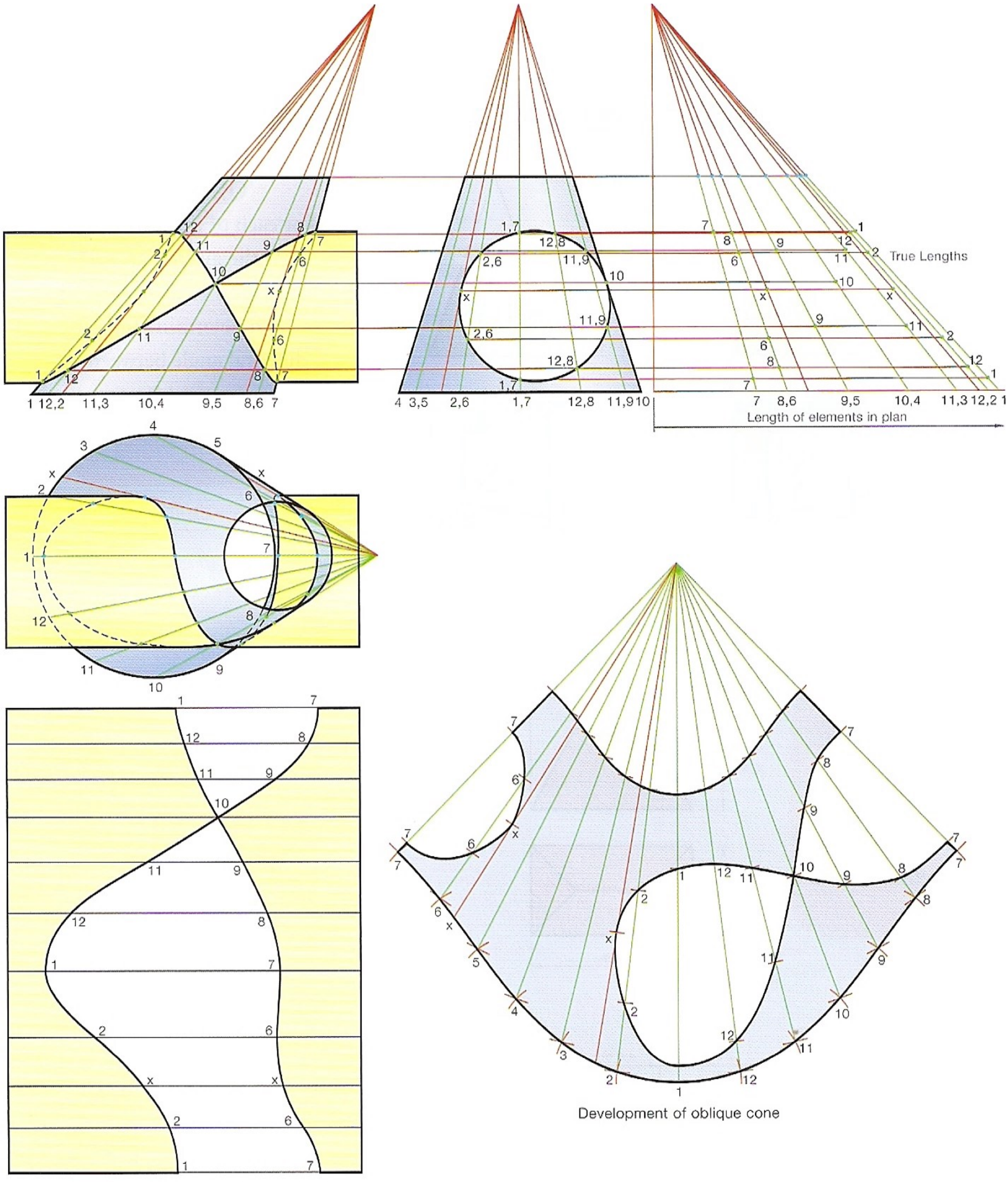
(i) Draw the given views and project a plan.

(ii) Find the joint line in all views.

(iii) Develop the surface of the transition piece.

(iv) Develop the surface of the circular duct.

The construction of this solution is very similar to the previous example. There are a large number of points to be found and proper indexing of points is essential.



Development of oblique cone

Development of cylindrical duct

Fig. 20.66