Intersecting Ductwork and Pipework

This section deals with the intersecting of ductwork and the subsequent development of the surfaces. We also look at intersection of pipework. This work is used extensively in the sheet metalwork industry where unusual jointing pieces and connectors would be made up as one-offs. The material in this section is very closely linked to chapter 11, Developments and Envelopments.

A rectangular section duct is to intersect a square section duct at an angle of 45° as shown in Fig. 20.13. Find the surface development of each ducting piece.

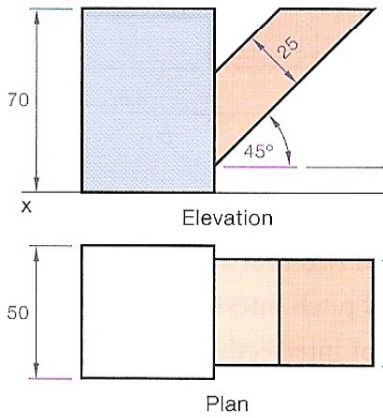


Fig. 20.

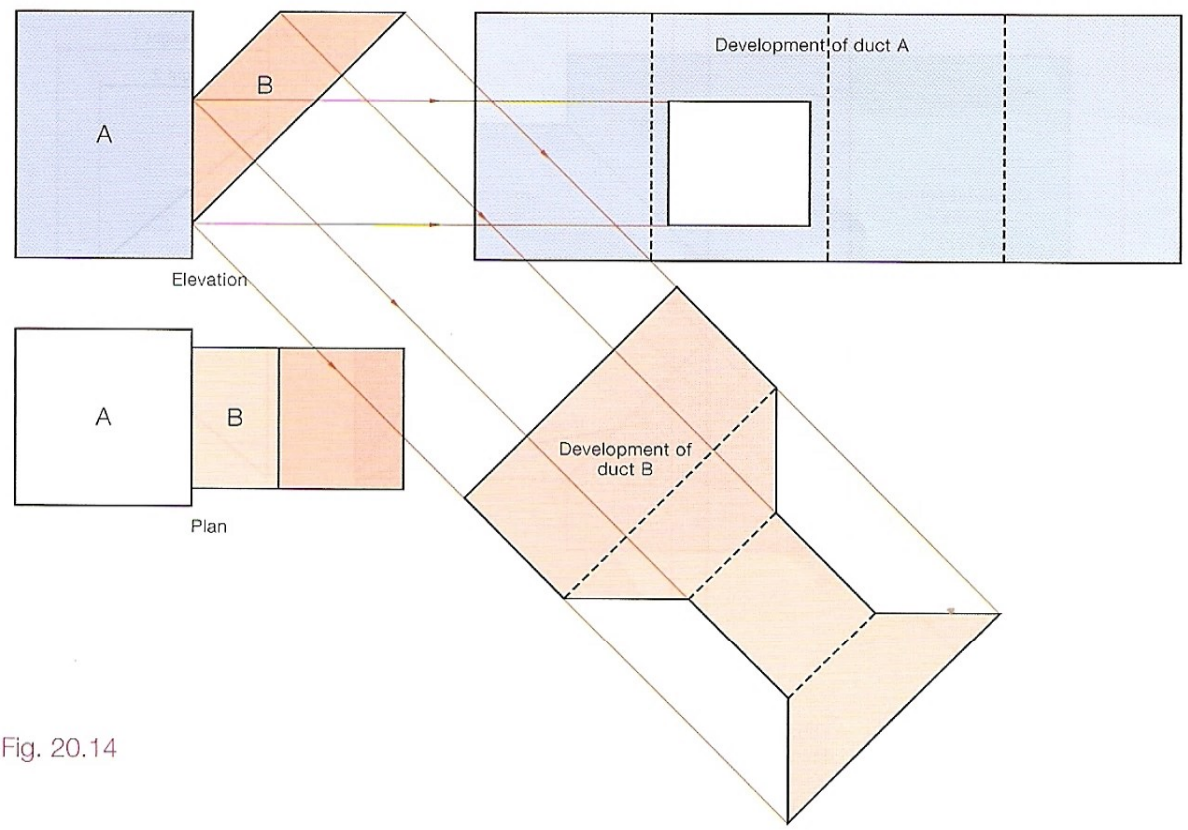


Fig. 20.14

A square sectioned duct of 50 mm side is being intersected by a rectangular sectioned duct of sides 32 mm × 50 mm. The ducts meet at an angle of 60°. Find the complete surface development of both ducting pieces in Fig. 20.15.

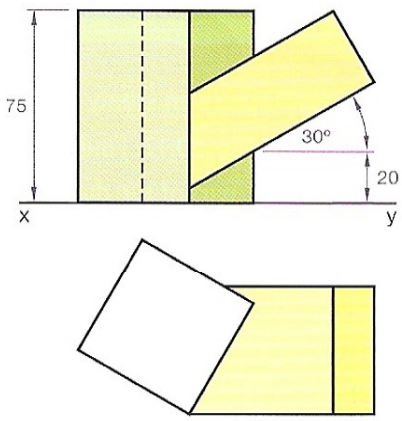


Fig. 20.15

(1) The line of intersection is found first. The points where duct B joins into duct A can be seen in plan and are projected up to elevation. The line of intersection will be made up of straight lines as the intersecting ducts are planar.

(2) The development of each duct piece is obvious from Fig. 20.16.

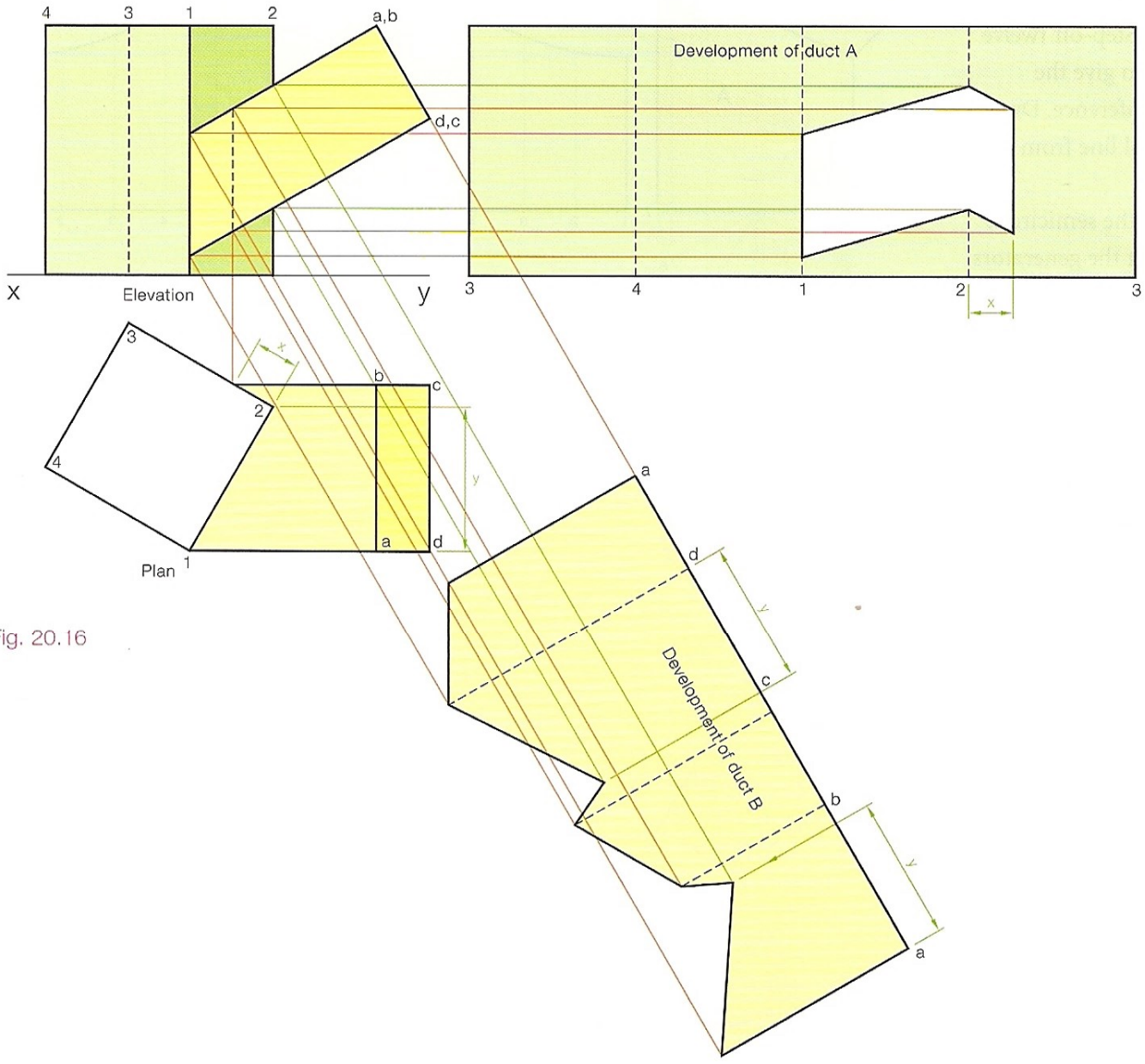


Fig. 20.16

Joining Pipes and Ducts of Equal Diameter

The elevation of an elbow joint for a circular duct is shown in Fig. 20.17. Find the development of the part of the duct marked A.

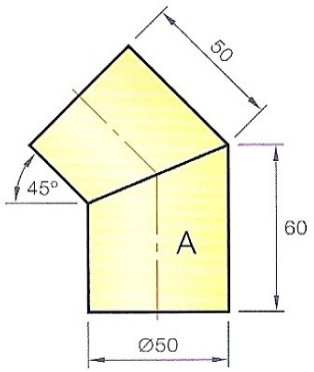


Fig. 20.17

(1) Set up the elevation. There is no need to draw a plan.

(2) Draw the half-duct as shown and divide into six equal parts. Index the points.

(3) Project the base of the front elevation to the right. Step-off twelve steps to give the circumference. Draw a vertical line from each step.

(4) From the semicircle, project the generators. The length of each generator is projected across to the development.

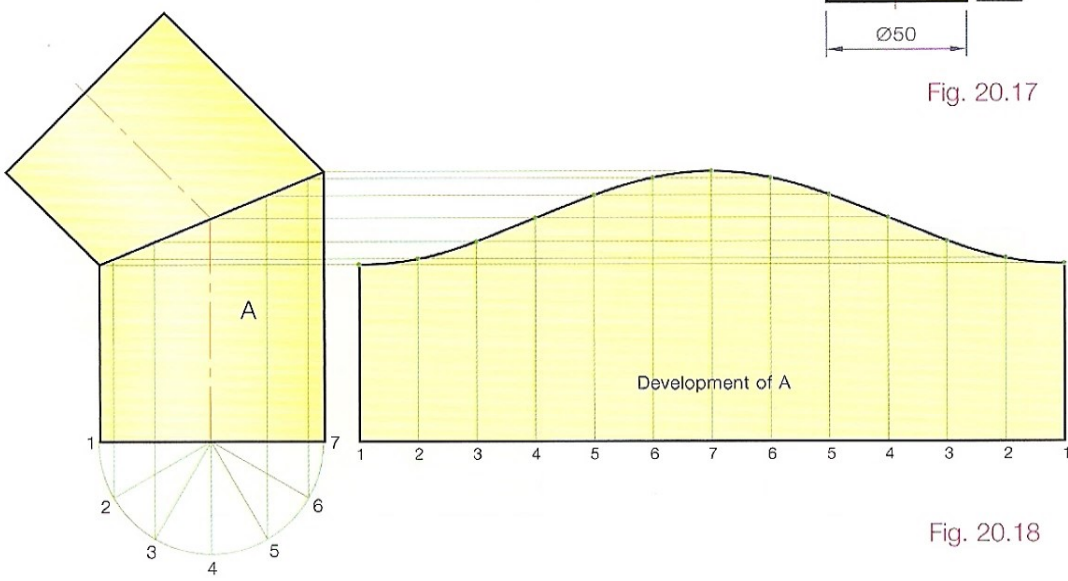
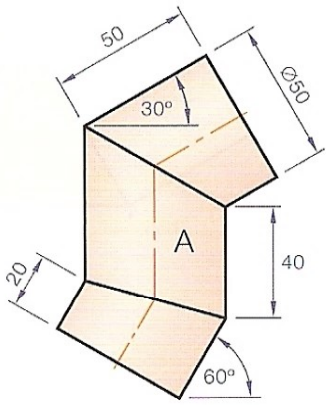


Fig. 20.18

The elevation of a double elbow joint for a circular duct is shown. Develop the surface of the section marked A, as in Fig. 20.19.



(1) In this case the circular section of the duct is drawn in the elevation. It is divided into twelve equal parts and the generators drawn through the divisions.

(2) The construction is as shown in the previous example.

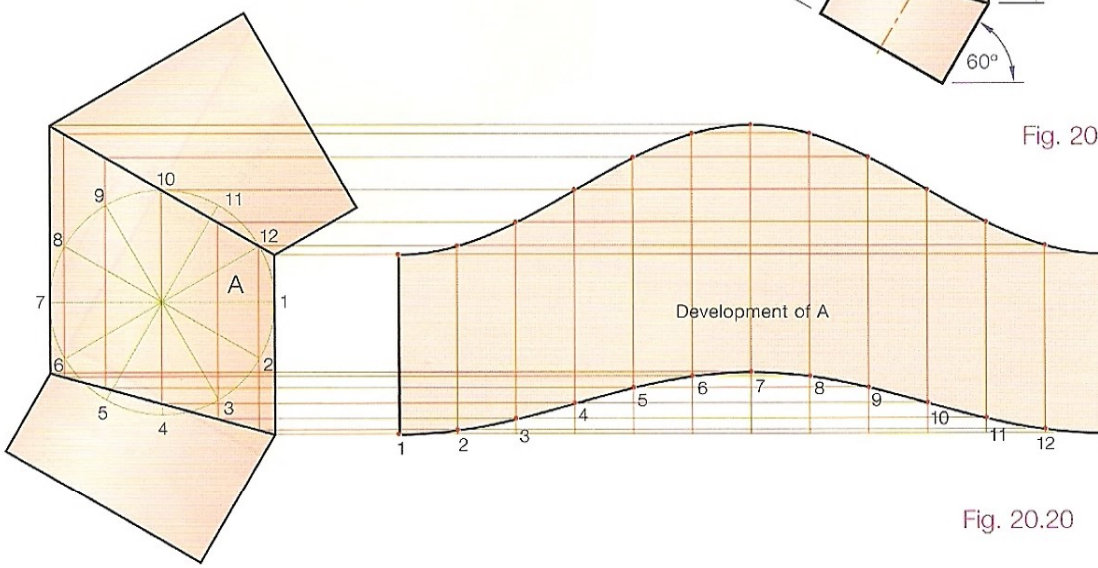


Fig. 20

Fig. 20.20

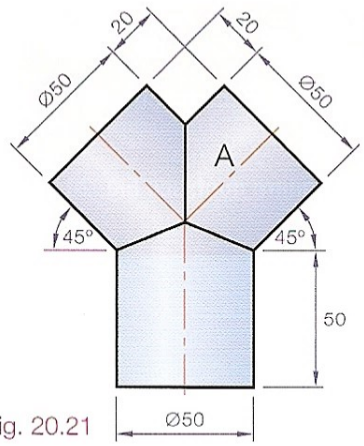


Fig. 20.21

The diagram shows a 'Y' joint between three 50 mm diameter pipes. Develop the surface of the section marked A, see Fig. 20.21.

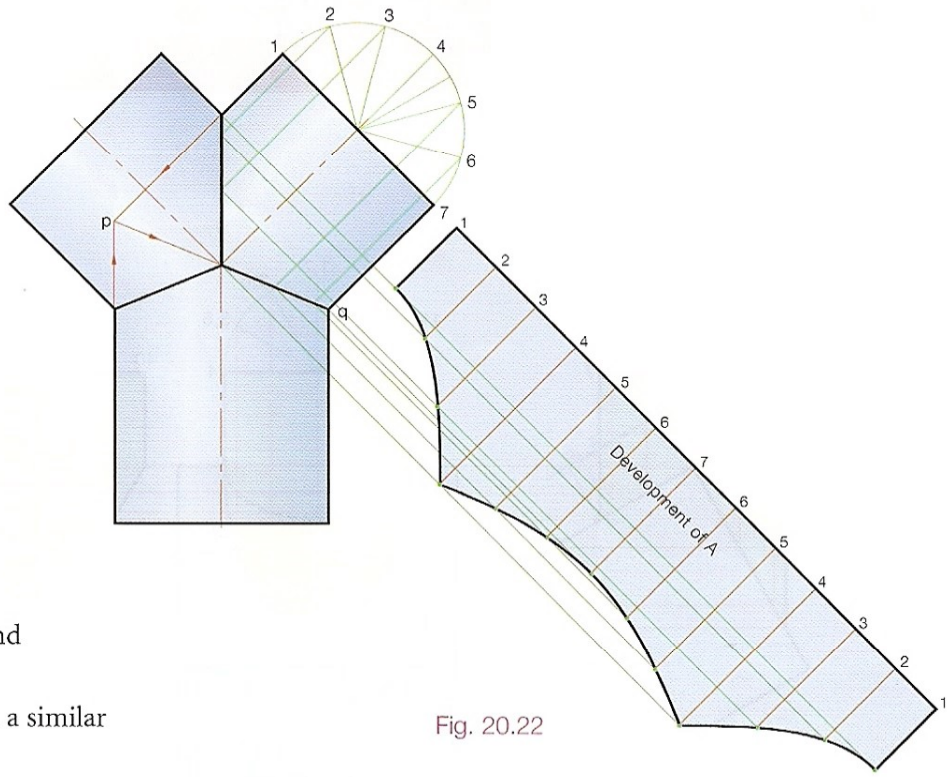


Fig. 20.22

(1) The joint lines are found by either halving the angles or by finding the intersection of the centre lines. Alternatively the sides of two of the pipes are extended to cross at p and q, giving one of the joint lines as shown. This is then repeated to find the other joint lines.

(2) The development is carried out in a similar way to the previous examples.

A pipe P intersects a larger pipe at right angles. Draw the given end view and complete the front elevation. Develop the surface of pipe P.

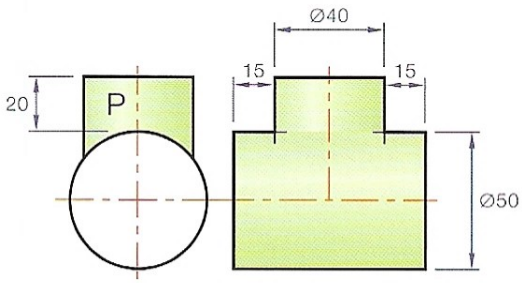


Fig. 20.23

(1) The line of intersection between the two pipes must be found. It will not appear as a straight line as it did in the previous three examples because the pipes are of different diameters. Where the generators in end view meet the circle they are projected across to find points on the generators in the front elevation.

(2) The development is done in the usual way.

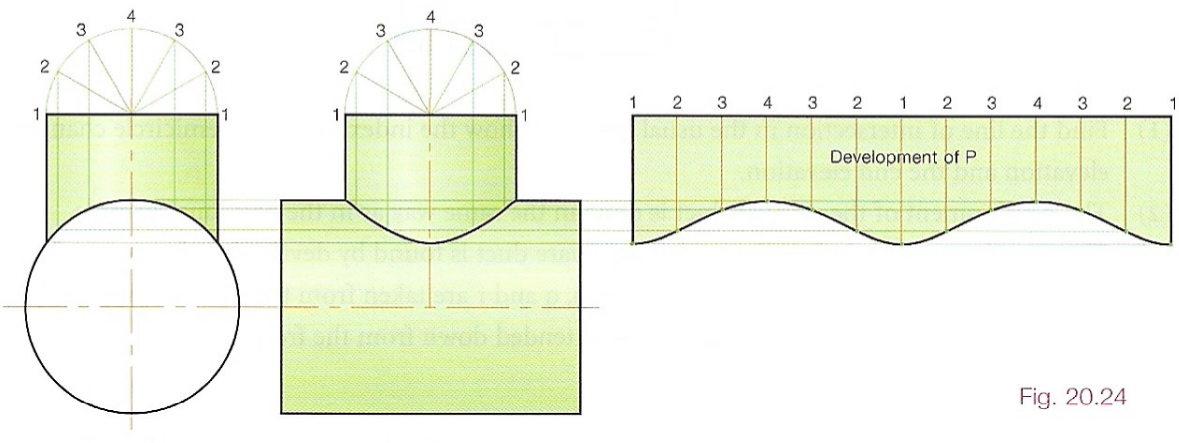


Fig. 20.24

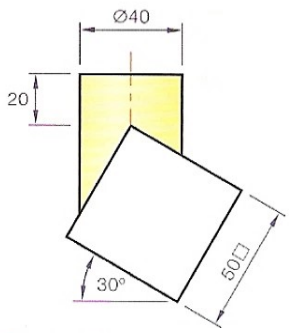


Fig. 20.25

A circular duct pipe intersects a square duct pipe as shown.

(i) Draw a front elevation and end view showing the line of intersection.

(ii) Develop the surface of the cylindrical duct.

(iii) Show the true shape of the hole to be cut in the square duct, see Fig. 20.25.

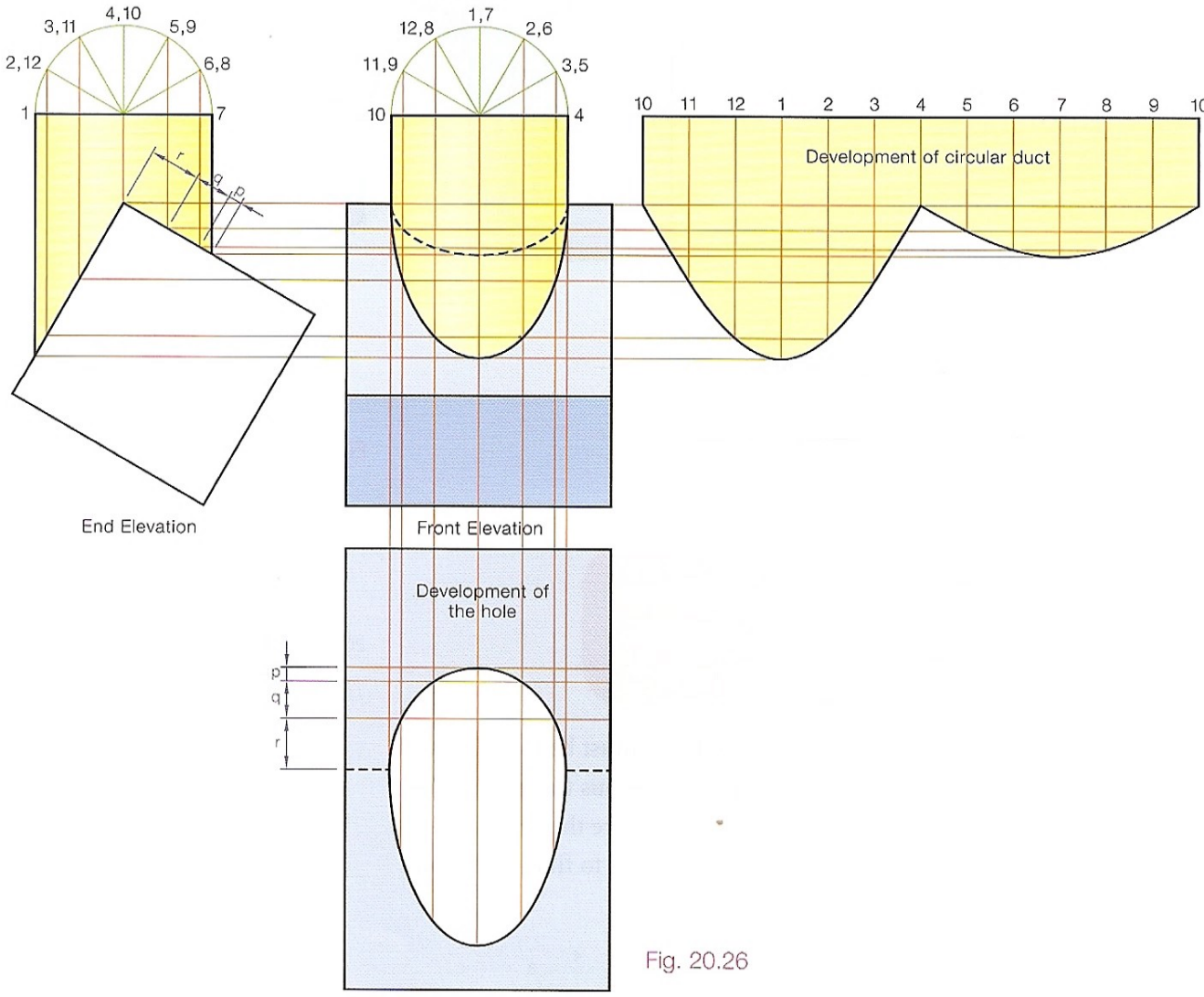


Fig. 20.26

(1) Find the line of intersection in the usual way. Note how the indexing of the semicircle changes between the front elevation and the end elevation.

(2) The development of the circular duct is done in the same way as in the previous example.

(3) The true shape of the hole to be cut in the square duct is found by developing the two surfaces that it straddles. The complete sides are developed first. Distances p, q and r are taken from the end view which shows the true length of the sides of the square duct. Generators are extended down from the front elevation. Similar construction for the other side of the square duct.

The diagram shows the end view of a T-junction joining a 40 mm diameter pipe and a 50 mm diameter pipe. One side of the smaller pipe is tangential to the larger pipe as shown, Fig. 20.27.

(i) Draw the given view and find the front elevation showing the line of intersection.

(ii) Develop the surface of the 40 mm diameter pipe.

(iii) Develop enough of the 50 mm diameter pipe to show the true shape of the hole to be cut in it.

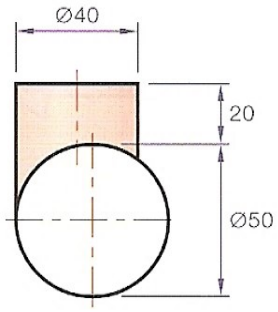


Fig. 20.27

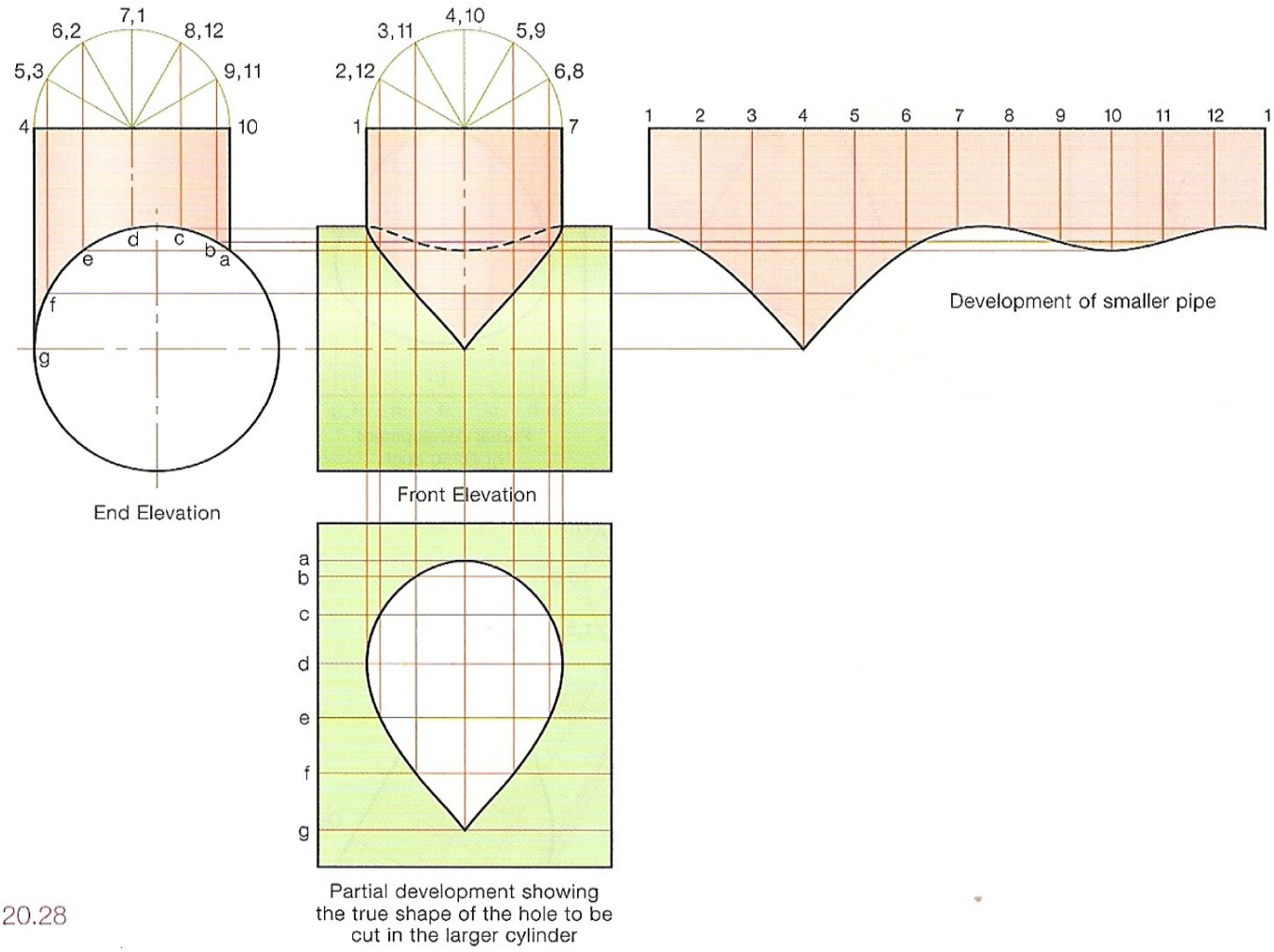


Fig. 20.28

(1) Draw the given end view and project across the front elevation. The construction of the line of intersection is as in the previous problem.

(2) When developing the larger cylinder we only develop enough of the surface to show the hole to be cut in it. Project down the sides of the cylinder from the front elevation. Choose a starting point and step-off distances a to b, b to c, c to d etc., as taken from the end view.

(3) Extend the generators to intersect these lines to give the hole's shape.

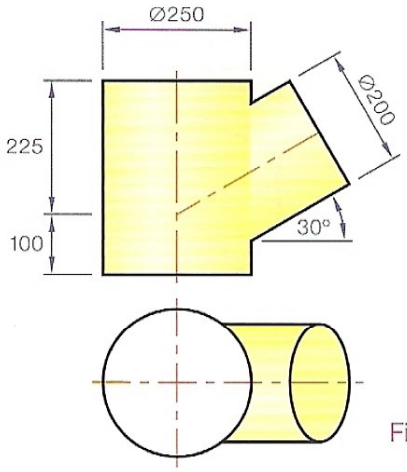


Fig. 20.29

The diagram shows the plan and elevation of two intersecting air-conditioning ducts. The ducts intersect at an oblique angle, see Fig. 20.29.

(i) Draw the given plan and elevation of the ducting, showing the line of intersection.

(ii) Project an end elevation.

(iii) Develop the oblique duct and show the true shape of the hole.

Scale 1:5

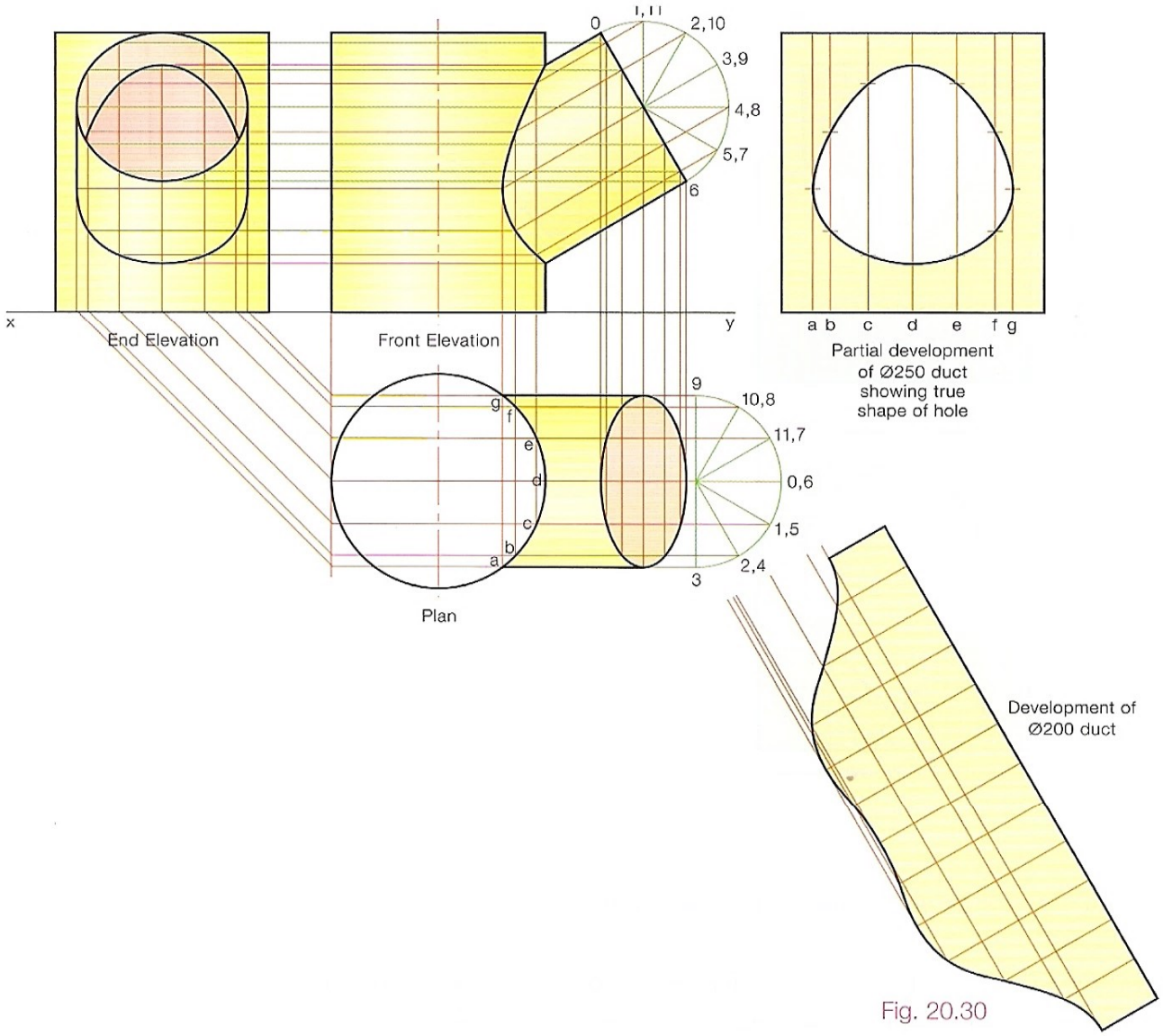


Fig. 20.30

Construction of the solution should be obvious from the drawing and follows the same pattern as the previous exam

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.

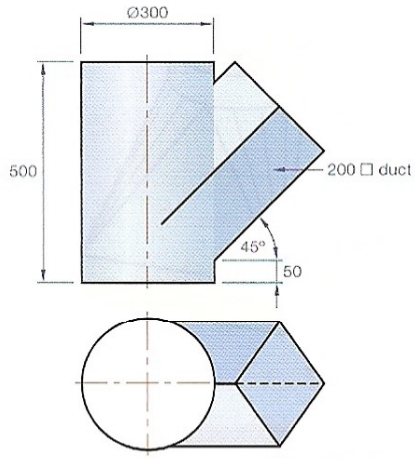


Fig. 20.31

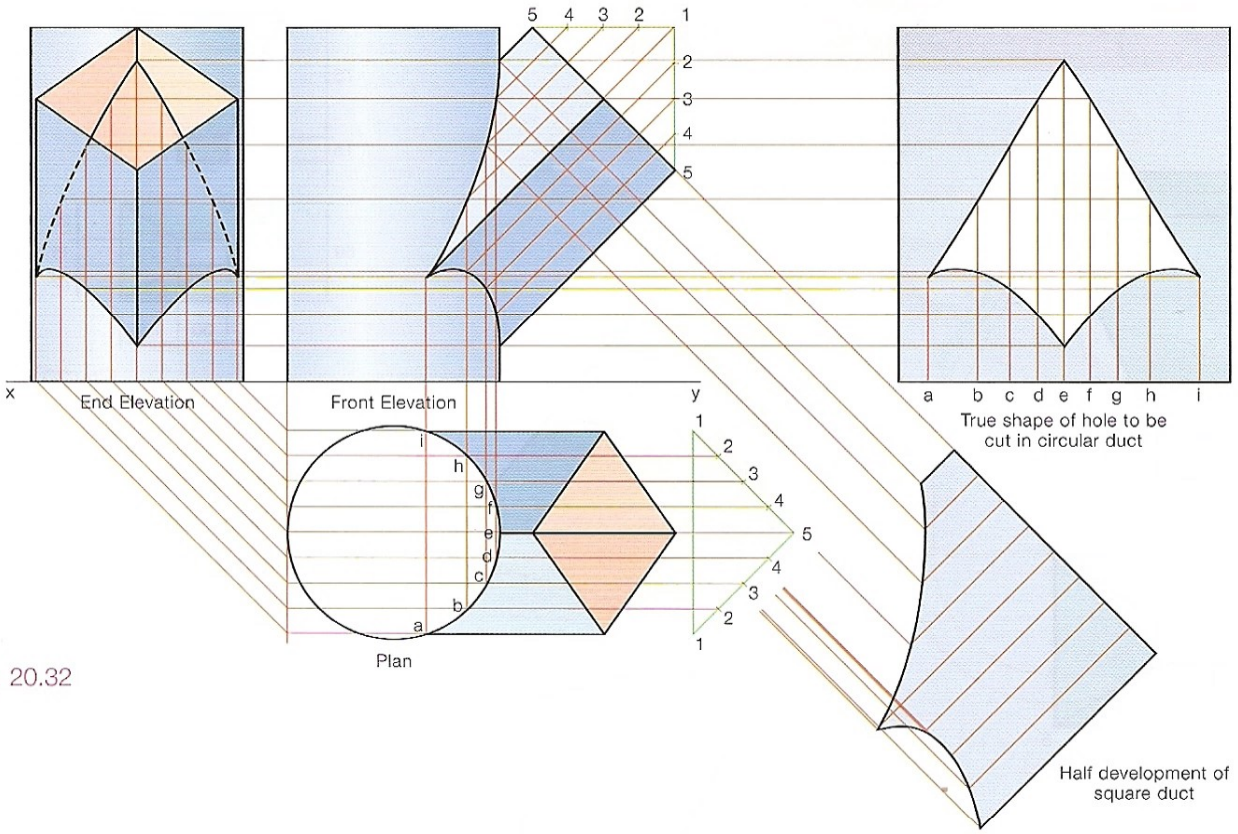


Fig. 20.32

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.