TRADE OF

Industrial Insulation

PHASE 2

Module 2

Geometry & Pattern Development

UNIT: 4

Equal & Unequal Tee Pieces

Produced by

SOLAS

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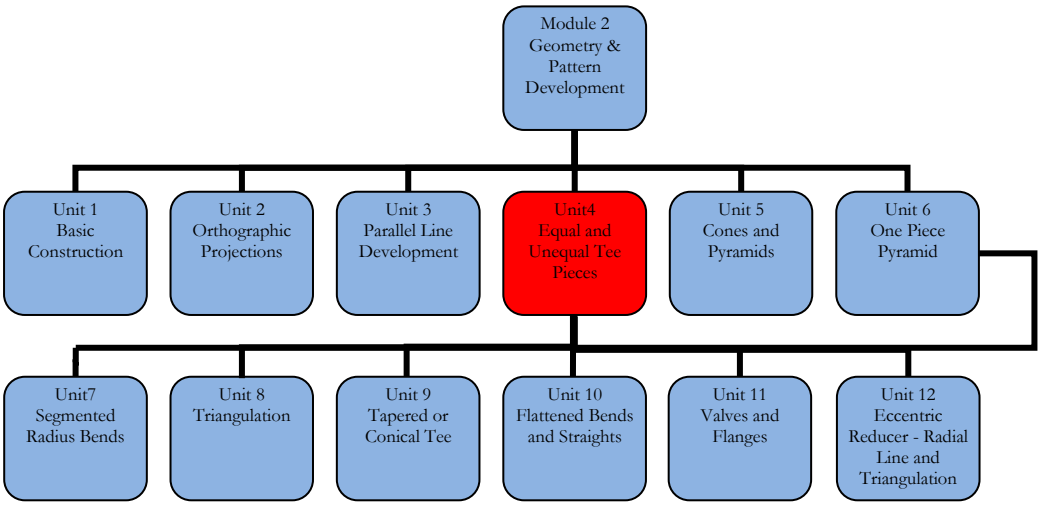
Table of Contents

Unit Objective

By the end of this unit ***each apprentice*** will be able to:

- Understand the difference between and equal and an unequal tee- piece.
- Draw orthographic views of equal and unequal tee-pieces.
- Develop patterns including allowances for equal and unequal tee-pieces.



Introduction

An equal tee-piece is where the pipe intersecting the main header pipe is the same diameter as the header pipe. Generally the mitre line or the joint line of an equal tee-piece will intersect as far as the centre line of the main header pipe.

An unequal tee-piece is where the pipe intersecting the main header pipe is of a smaller diameter than the header pipe. The mitre line or joint line of an unequal tee-piece will not intersect as far as the centre line of the main header pipe.

1.0 Equal Tee-Pieces

Key Learning Points

- Identification of equal and unequal tee-pieces
- Layout of an equal tee-piece
- End view projection
- Construction of development lines
- Lines of intersection
- Position of joint lines

1.1 Identifying an Equal and an Unequal Tee-Piece

An equal tee-piece is where the pipe intersecting the main header pipe is the same diameter as the header pipe. Generally the mitre line of an equal tee-piece will intersect as far as the centre line of the main header pipe.

An unequal tee-piece is where the pipe intersecting the main header pipe is of a smaller diameter than the header pipe. The mitre line of an unequal tee-piece will not intersect as far as the centre line of the main header pipe.

1.2 Developing a Pattern for an Equal Tee-Piece

A common group of round pipe fittings laid out by parallel line developments are intersecting pipes, commonly called tees. These are laid out like any problem in parallel line development. However, there is one new principal to learn when laying out intersecting pipes and that is the development of the intersecting line of the two pipes. The line is called the mitre line. The pattern for the tee-piece cannot be laid out until the mitre line is developed. Therefore, developing the mitre line is the first step in laying out such a pattern.

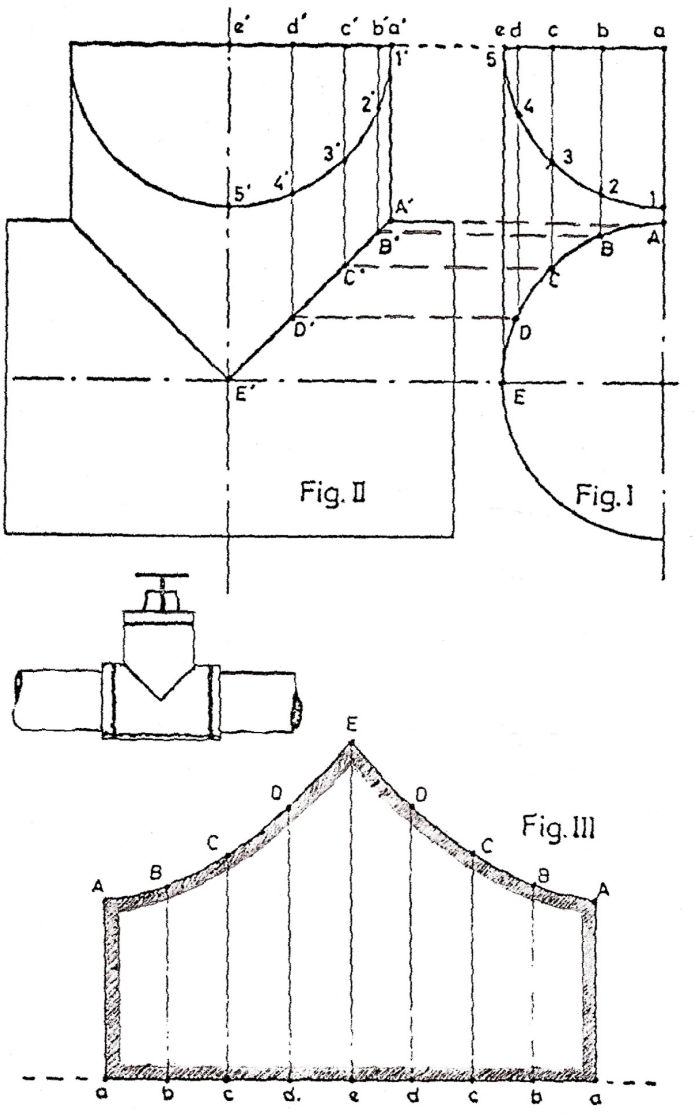
The following procedure is to be followed when developing a pattern for both an equal and an unequal tee-piece.

1. Draw the side elevation and the plan view of the tee-piece.
2. A semi-circle is drawn for the intersecting pipe on both the side elevation and plan view. Divide the semi-circle into six equal parts.
3. On the side elevation project the six equal parts as lines as far as the centre line of the main header pipe.
4. On the plan view project the six equal parts as lines until they hit the curvature of the main header pipe.
5. When these lines hit the curvature of the main header pipe project them at right angles onto the side elevation.
6. Since the semi-circle lines on the side elevation and the semi-circle lines on the plan view locate the same measuring lines, when point a on the plan view is projected to intersect line 1 on the side view, this gives the

exact spot where line 1 intersects the curve of the main pipe and it is therefore a point of the mitre line.

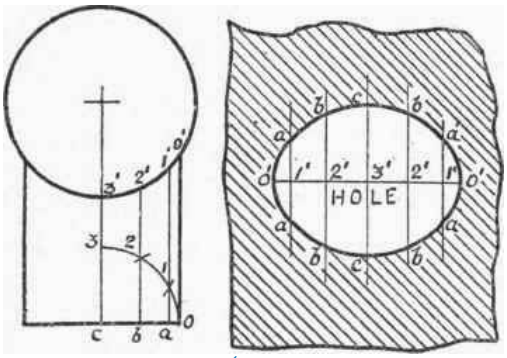
7. When all the points are found by the intersecting of the corresponding lines, the mitre line is drawn in, and the patterns for both pipes can be laid out by parallel line development.

Refer to Module 2-Unit 3-Parallel Line Development.



1.3 Hole of Penetration

The hole of penetration is the portion of material which must be removed from the development of the main header pipe where the branch pipe intersects it.



The development of the hole of penetration for an unequal tee is as follows:

- Draw a base line 0-0 as shown.
- Take the distance 0' to 1' where the branch pipe intersects the main pipe and transfer this distance from 0' on the base line to give point 1',continue this process to give points 2' and point 3' and back to 0' ain.
- From these points construct perpendicular lines above and below the base line.
- From the quarter circle on the bottom of the smaller pipe take the distance from a to1 and transfer this to 1' on the base line remembering to mark this distance above and below the line. Do the same process for b to 2 and c to 3. Point 0 is the start of the hole of penetration and so is directly above itself.
- Join up these points using a flexi-curve to give the hole of penetration for an unequal tee-piece. The same process will take place for an equal tee.

1.4 Position of Joint lines

Refer to Module 2- Unit 3 – section 1.2

1.5 Projection of Views

Refer to module 2 – unit 2 – Orthographic projections

2.0 Unequal Tee-Pieces

Key learning Points

- Pattern development of an unequal tee-piece
- True shapes of holes of intersection

2.1 Developing a Pattern for an Unequal Tee-Piece

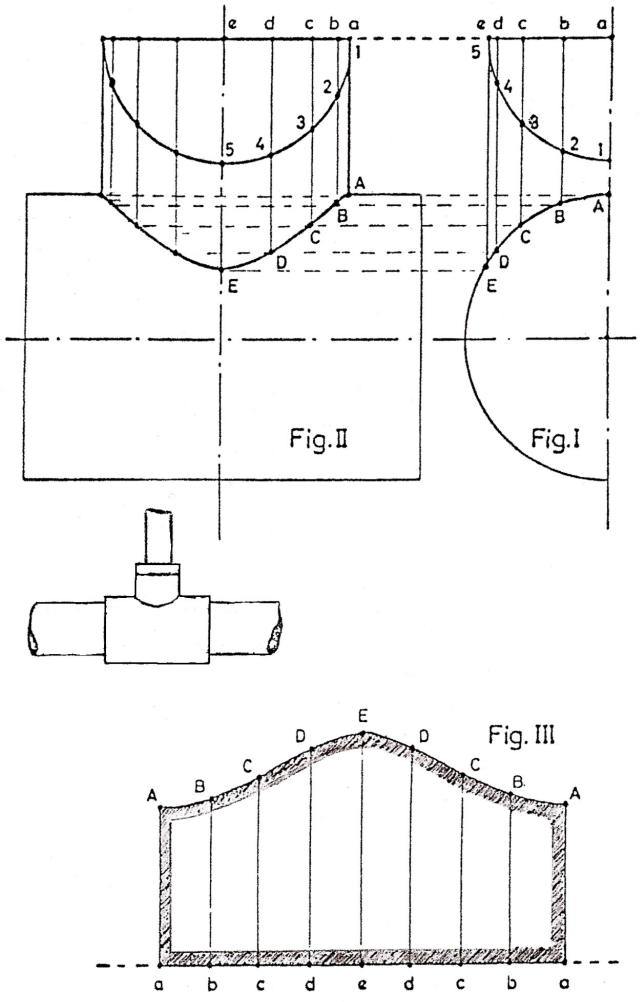


Figure I: Half a side elevation.

Figure II: Elevation.

Figure III: Half a development of the socket.

After determining the diameter of the large pipe and the diameter of the smaller pipe in figure I, draw the quarter circle with the centre at the point a. Divide the quarter circle into 4 equal parts. At points 2 to 4 draw parallel lines to the middle line intersecting the large circle at points B to D.

The development of figure III is obtained by first determining a base line and on it laying off the line segment 1 to 2 of figure I 8 times for half the circumference of the pipe. At points a to e draw perpendiculars and lay off the respective generating lines aA, bB etc of figure I on them. The connecting line of points A to E is a curve.

In practice, figure II is not essential for the development.

2.2 Developing a Pattern for an Equal Diameter Oblique Tee-Piece

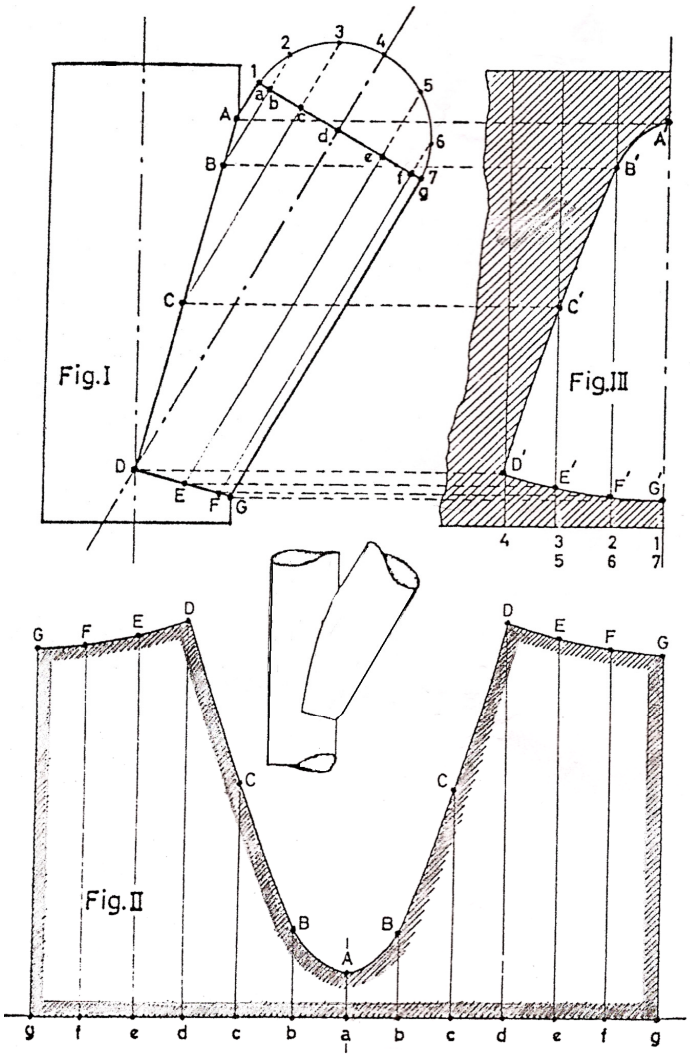


Figure I: Elevation.

Figure II: Inclined Branch pipe.

Figure III: Half the hole of penetration in the main pipe.

After determining the diameters and the angel of inclination of the branch pipe, first draw figure I. In the elevation the joint lines A to D and D to G are always straight lines when the diameters are equal, and point D is the point of intersection of the middle lines of both pipes. Draw the semicircle with point d as the centre and divide it into six equal parts. At points 2 to 6 draw the parallel lines to the middle line Dd. These parallel lines intersect the penetration or

joints at points B to F. The line lengths aA, bB, cC etc. are the generating lines in their real or true lengths.

The development of the slanted branch pipe is shown in Figure II and is developed as usual.

In figure III the true size of the piece that is cut out (hole of penetration) of the main pipe is shown. Points A' to G' are the intersecting points of the perpendiculars at points A to G of figure I and the perpendiculars at points 1 to 4 of figure III. Points 1 to 4 of figure III are obtained by laying off the line segment 1 to 2 of the arc in figure I three times on the base line of figure III with the compass.

In practice, the cut out piece usually is not determined by drawing but instead the already developed and rounded branch pipe is held against the main pipe where a scriber or marker is used to draw the hole of penetration onto the main pipe.

2.3 Fixing Holes for Pattern Assembly

Refer to Module 1 – Unit 9 – Metal cladding assembly work.

Refer to Module 1 – unit 5 – General allowances for insulation and cladding.

Refer to module 1 – unit 4 – Notching, folding and joining.

Summary

An equal tee-piece is where two pipes of the same diameter intersect each other at 90 degrees. The joint line or mitre line on an equal tee-piece will go all the way to the centre line of the intersecting pipe. An unequal tee-piece is where one pipe intersecting another is smaller than the main pipe. The joint line or mitre line will not go the centre line of the main pipe.

The metal which is removed on the pattern where one pipe intersects another is known as the hole of penetration. This metal can be removed during the developing stage of the pattern, however, in practice, the cut out piece usually is not determined by drawing but instead the already developed and rounded branch pipe is held against the main pipe where a scriber or marker is used to draw the hole of penetration onto the main pipe.

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