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<tr>
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Module 2 – Geometry and Pattern Development

Unit 1 – Basic Construction

Duration – 7 Hours

Learning Outcome:

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

- Identify and use standard drawing equipment
- Identify and draw types of lines used in technical drawing
- Construct, bisect and divide lines and angles
- Construct circles and tangents
- Locate tangent points and arc centres
- Comprehend the fundamentals of geometric construction
- Use scale rule

Key Learning Points:

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Training Resources:

- Drawing instruments, equipment and materials
- Textbook: The Geometry of Sheet Metalwork
- Instructor handouts, drawings

Exercise

Sample exercise – Figure 1 and Figure 2.

Key Learning Points Code:

M = Maths  D = Drawing  RK = Related Knowledge  Sc = Science  
P = Personal Skills  Sk = Skill  H = Hazards
Figure 1 - Basic Construction 1
Figure 2 - Basic Construction 2


**Geometry**

**To Locate the Centre of an Arc or a Circle 'A'**

Select three points C, D and E on the arc AB. Bisect the arc lengths between these points, using C, D and E as centres. The point O where the bisectors intersect will be the centre of the given arc or circle.

![Figure 3 - A - To locate the Centre of a given Arc or Circle](image1)

**B - How to Construct a Right-Angle in a Semi-Circle**

Select any point C on the circumference of the given semicircle and draw lines from the diameter to termination points A and B to C. Then the angle ACB is 90°. Similarly the angles at E and D are right-angles.

![Figure 4 - B - To Construct a Right-Angle Triangle in a Semi-Circle](image2)
C - How to Construct an Ogee Curve

The termination points of the curve AB are normally given dimensionally. Join A and B by a straight line and bisect it at C. With radius R equal to the required radius of the curve, and with points A, C and B as centres, draw arcs to locate D and E. With the radius and centres D and E complete the curve.

Figure 5 - C - To Construct an Ogee Curve
**Tangential Arcs**

Figure 6 shows the constructions associated with tangential arcs. Fig. A shows the construction for an arc that is tangential to a circle and a straight line. Construct a parallel line, at a distance equal to the given radius R1, to the given straight line AB. Add R1 to the radius R of the given circle and from the centre of the circle draw an arc to locate point O. With centre O and radius R1 draw the required arc to touch the straight line and the circle.

Fig. B shows the construction of the external, tangential arc. Let R represent the radius of the given arc, and R1 and R2 the radii of the circles it is required to touch. Subtract the circle radii from the given radius of the arc, in turn, and from the respective centres of the circles draw arcs to intersect at point O. With O as centre and radius R draw the required arc to touch the circles externally.

Fig. C shows the construction of the internal, tangential arc. Add the circle radii to the given radius of the arc R. From the respective centres of the circles draw arcs to intersect at a point O. With O as centre and radius R, draw the required arc to touch the circles internally.
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