

TRADE OF  
**Industrial Insulation**

PHASE 2

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Module 5

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Ductwork & Vessels

UNIT: 2

**Off-Centred Rectangle to Round**

*Produced by*

**SOLAS**

**An tSeirbhís Oideachais Leanúnaigh agus Scileanna**  
Further Education and Training Authority

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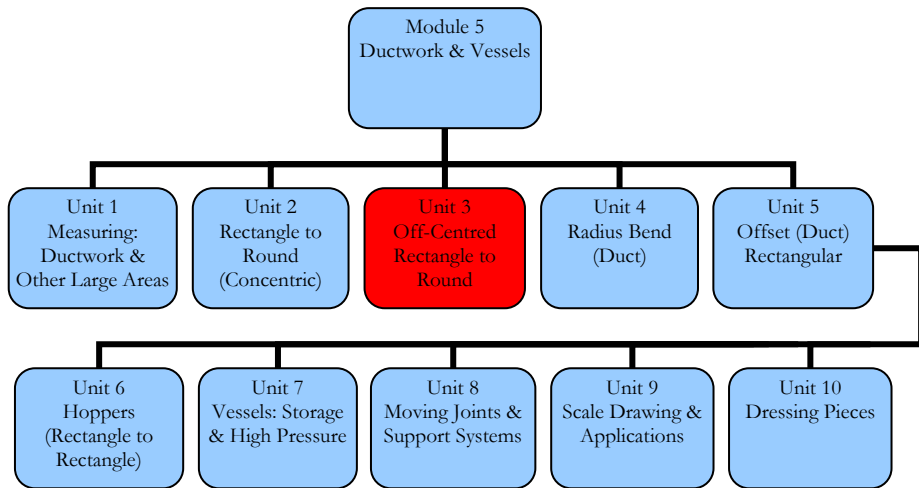
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# Introduction

A very common problem in metal work, particularly in pipe work and ductwork, is the rectangle to round transformer. The transformer can either be concentric (on centre) or eccentric (off centre). Its object in ductwork is to transform a square or rectangle duct to a round pipe, or to connect a round pipe to a square or rectangular opening. Rectangle to round transformers are often used when transitioning onto fan units and air-handling units.



## Unit Objective

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

- Describe and give examples of the applications for eccentric transformers in industrial applications.
- Accurately measure and neatly sketch an eccentric ductwork transformer.
- Mark out the pattern and fabricate an eccentric transformer.

# 1.0 Measuring and Sketching

## Key Learning Points

- Accurate measuring of an existing eccentric transformer
- Explanation of the term ‘eccentric’
- Applications of eccentric transformers
- Use of a spirit level and plumb line
- 3D sketching. Insulation allowances

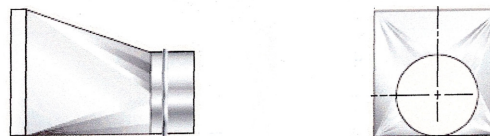
## 1.1 Explanation of the Term “Eccentric”

The word ‘eccentric’ with regard to a rectangle-to-round means ‘not placed centrally’ or off-centre. When a cone (right or oblique) or a square or rectangle-to-round is on-centre it is ‘concentric’ and when off-centre it is ‘eccentric’.

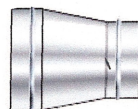
Rectangular to Round (Standard)



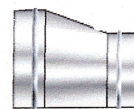
Rectangular to Round (Offset)



Concentric Reducer



Eccentric Reducer



## 1.2 Applications of Eccentric Transformers in Industry

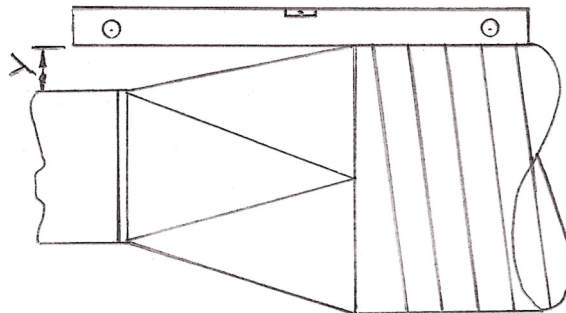
Off-centre or eccentric transformers are used in industry where a duct system has to change direction due to an obstruction or obstacle in the way. They are also used at times to connect up air-handling units on a rooftop of a building for example where round or spirally-wound duct has to be connected to the unit. It is always better and cheaper to produce an on-centre transformer but this is not always possible due to the design and layout of a duct system.

## 1.3 Accurate Measuring of an Existing Eccentric Transformer

*Refer to Module 5 – unit 1 – section 1.7.*

## 1.4 Use of Plumb Line and Spirit Level

See *unit 1 – 1.6* for details on plumb line and spirit level and *1.7* for accurate centre finding. Diagram x (Fig x) shows an eccentric transformer. Use the spirit level to find offset distance 'Y'. It can also be used on the bottom of the duct as well. If joints on the transformer are in the way of the level a small piece of timber can be used under the level to get it over the joint and the thickness of



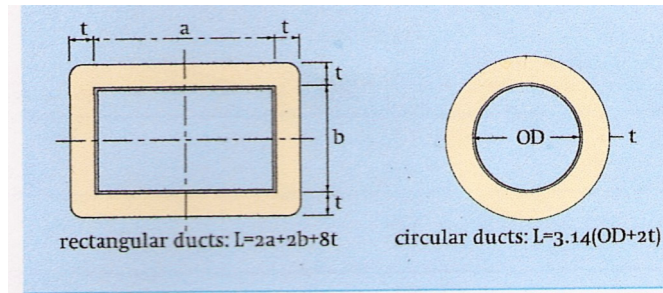
the timber can be taken into consideration when calculating distance 'Y'.

*Elevation*

## 1.5 3D Sketching

*Refer to Module 2 – Unit 2.*

## 1.6 Calculation of Insulation Allowances



The allowances for estimating the insulation length of the top and bottom of the rectangle to round transformer are the same as for a rectangle or round duct as recommended by the manufacturers.

## 1.7 Use of Manufacturer's Data Sheets

*Refer to module 4 – unit 3 – Insulation thickness, thermal conductivity and performance criteria.*



## 2.0 Marking out, Fabrication and Fitting of Insulation and Cladding

### Key learning Points

- Pattern development – triangulation
- Determination of true lengths
- Sources of error in pattern development
- Use of lettering and numbering in pattern development
- Efficient use of pattern development in pattern layout
- Accurate cutting, forming and assembly

### 2.1 Pattern Development – Triangulation

Refer to Module 2 – Unit 8 – Triangulation.

### 2.2 Seam allowances.

- Male/Female Swage on top of transformer = allowance 3-5 mm (depending of Swage Size)
- Lap joint – allowance 15-25 mm
- Bottom of transformer – depending on joint being used.
- Slip Joint – Allowance 25-50 mm
- Standing Seam – 25 mm: Allowance 25 mm Single Edge
- 50 mm Double Edge

Note: Variations on the above allowances can occur due to the personal preferences of the operator as well as sizes of joints used.

### 2.3 Marking Out, Cutting, Forming, Swaging and Assembly.

**For marking out of the transformer refer to module 2 – unit 8**

When fabricating the off-centre rectangle-to-round the pattern is marked out in two halves for economy of metal, ease of fabrication and convenience for fitting on site. The patterns are cut out by guillotine, power hand shears and notched using a snips. The patterns are punched, swaged and ready for forming. Larger patterns can be formed on a press brake or in a manual folding machine or smaller transformers can be shaped over a round bench bar. A lot depends on the machinery available and the skill and preference of the operators.

## ***2.4 Use of letters and numbers in pattern development.***

Refer to module 2 – unit 8 – triangulation.

## ***2.5 Efficient use of material when developing patterns.***

Refer to module 2 – unit 8 – triangulation.

# **3.0 Health and Safety.**

### **Key learning points:**

- Safe handling of sharp edges and waste materials.

## ***3.1 Safe handling of Insulation and cladding materials.***

Refer to module 4 – unit 5 – Health and safety.

Refer to module 1 – unit2 – Manual handling.

## Summary

Rectangle to round transformers are often used when transitioning onto fan units and air-handling units. These units are often mounted outside a building and more times than often require insulation and cladding. Triangulation is the development method used for marking out a rectangle to round transformer. The use of numbering and lettering when marking out the transformer is vital in ensuring the correct pattern is developed.

Insulating a rectangle to round transformer is very similar to insulating a square or circular pipe/duct, as in the same allowances for insulation thicknesses are used.

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