TRADE OF

Industrial Insulation

PHASE 2

Module 5

Ductwork & Vessels

UNIT: 2

Rectangle to Round (Concentric)

Produced by

SOLAS

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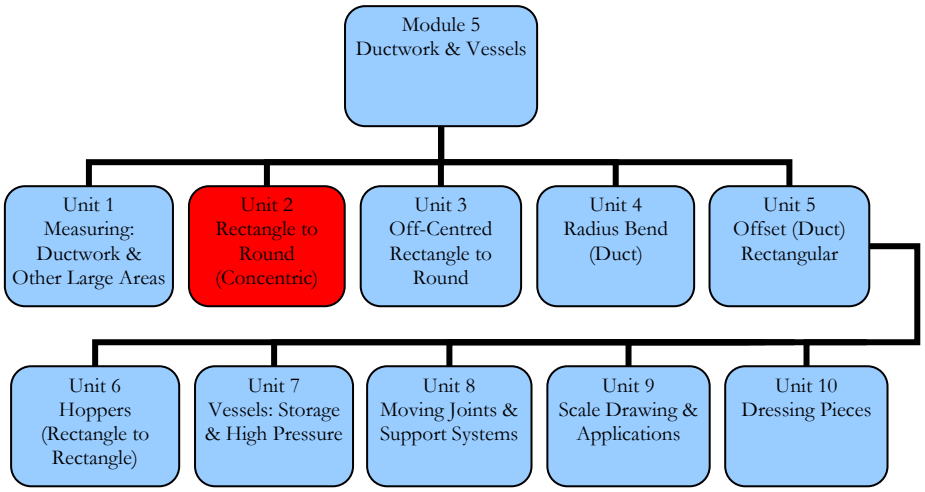
Introduction

A very common problem in metal work, particularly in pipe work and ductwork, is the rectangle to round transformer. 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:

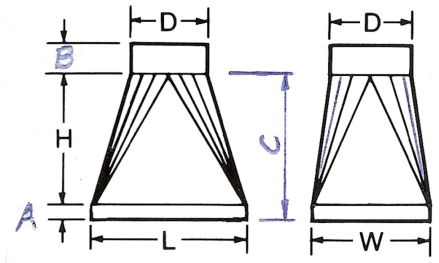
- Measure and sketch a rectangle to round transformer.
- Calculate the area of a measured piece.
- Mark out and fabricate a rectangle to round transformer.
- Insulate and fit cladding to a rectangle to round insulated transformer.

1.0 Measuring and Sketching

Key Learning Points

- Accurate measuring
- 3D sketching: Isometric projection
- First and third angle projection
- Calculation of insulation allowances
- Use of manufacturer's data

1.1 Accurate Measuring of an Existing Rectangle to Round (Concentric) Transformer



When measuring the on-centre/concentric rectangle to round transformer we need the following measurements:

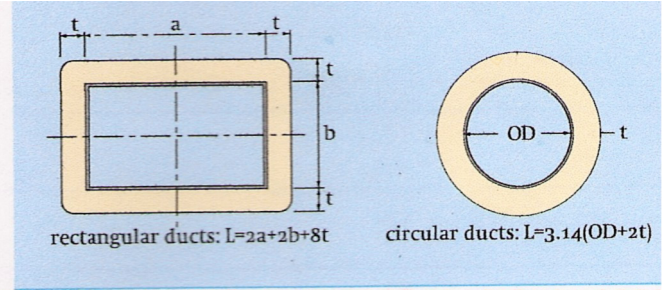
- L = Length
- W = Width
- A = Flange allowance
- H = Height
- B = Spigot height (if not used as part of the slip joint arrangement)
- D = Diameter of spigot

Note: Measurement C on site could be the overall height of the transformer as the spigot B could be fitted inside the connecting round duct making it redundant as a measurement for insulation and cladding purposes.

1.2 3D sketching: Isometric projection, First and third angle projection.

Refer to Module 2 – Unit 2.

1.3 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.

1.4 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
- Marking out and fabrication
- Properties of aluminium sheet
- Seam allowances
- Use of stiffening folds
- Forming and swaging
- Joint weathering
- Insulation and vapour barriers
- Dew points and ambient temperatures
- Cladding fitting

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 on-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.

The two halves are assembled using self-tapping screens and the top is swaged either male or female.

2.4 Use of Stiffening Folds

When the two halves are being formed by folding, the folds are shaping the transformer to its finished shape, as well as imparting stiffness into the transformer. These folds also enhance to overall finish and appearance of the job.

2.5 Joint Weathering

Joints should be arranged when fitted to shed water, as water is the number one enemy of an insulation system. If water gets into a joint it can wet the insulation but over time it can cause major problems by way of corrosion to pipe-work etc under the insulation. This can be a very costly problem if it is not rectified in time.

2.6 Insulation with Vapour Barrier

It is very important that insulation covered with a vapour barrier should not be damaged when the cladding is being fitted. The vapour barrier can be punctured or damaged by self-tapping screws or pop rivets.

Refer to module 1 – unit 10 – Pipe insulation (hot and cold) Material selection and application.

2.7 Fitting Cladding Over an existing Rectangular-to-Round Transformer with Insulation Fitted

The first stage is to measure the fitting as mentioned earlier in ***section 1.1*** and allow for the insulation thickness all over the fittings. It is important to get back to the bare surface of the transformer to take accurate measurements before the insulation is fitted. This will make the measuring of the overall job easier. The next stage is to cut out and fit the insulation to the transformer and seal the joints with aluminium foiled tape. If supports such as "Z" sections are required, the insulation can be cut out to facilitate these and the "Z" sections can be fitted. The cladding which is generally manufactured in two halves, is assembled with joints properly weathered, secured and sealed.

2.8 Properties of Aluminium Sheets

The main properties of aluminium are: it is light weight, corrosion resistance and has a good clean appearance. Sheet aluminium weighs approximately one third as much as sheet steel and is just about as strong. It is used to its advantage where high strength and low weight are required, as in vehicle construction.

Pure aluminium is too soft to hold a permanent shape in sheet form so the sheets are always manufactured as alloys. Some of the main alloying metals are copper, zinc, manganese, silicon and magnesium.

As mentioned earlier, aluminium has a good strength to weight ratio, good corrosion resistance and is an excellent conductor of both heat and electricity. It is a good reflector of both visible light and heat making it an ideal material for light fittings, thermal rescue blankets and architectural insulation. It is non-toxic which means it doesn't release any odours or taint products in which it is in contact. This makes aluminium suitable for use in packaging for sensitive products such as food or pharmaceuticals where aluminium foil is used. It can be recycled which means cutting down on the amount of ore, bauxite, that has to be mined thus preserving valuable natural resources and saving energy.

2.9 Den Points and Ambient Temperatures

Refer to module 4 – unit 4 – section 1.3 - Terms and definitions used in the Insulation industry.

3.0 Health and Safety

Key Learning Points

- Safe handling of Insulation and cladding 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.

The use of aluminium as a cladding material is ideal as it is lightweight, durable, corrosion resistant and it has a good appearance. Pure aluminium is too soft to hold a permanent shape in sheet form so the sheets are always manufactured as alloys. Some of the main alloying metals are copper, zinc, manganese, silicon and magnesium.

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