TRADE OF

Industrial Insulation

PHASE 2

Module 1

Sheet Metal and Insulation Fundamentals

UNIT: 8

Pipe Cladding (Basic) Fabrication & Application

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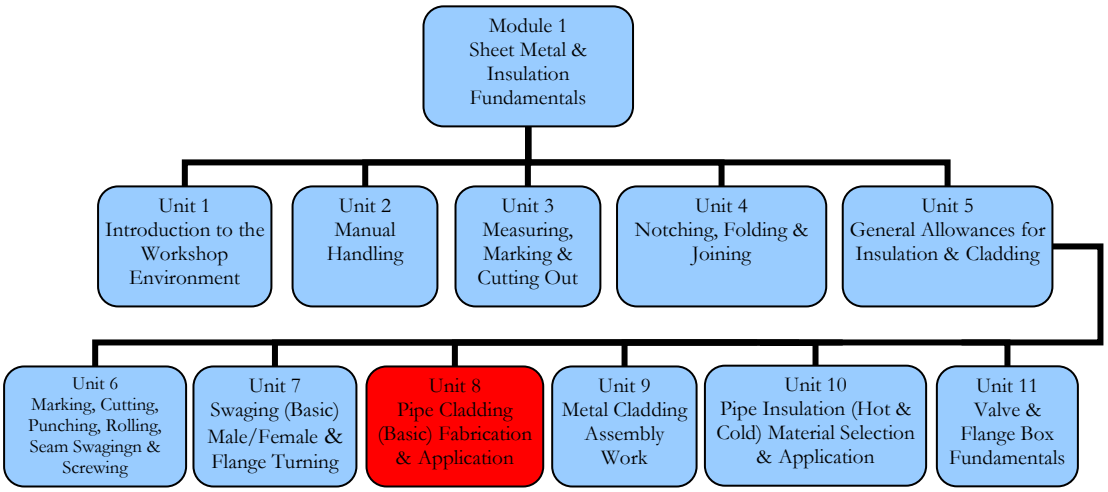
Introduction

The fabrication and application of cladding pipes and fittings requires a high level of skill and knowledge of pattern development, metal forming and the ability to solve problems. Every job will differ in some shape or form and the industrial insulator must be able to meet the challenges of each project, and deliver a top quality job every time.



Unit Objective

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

- Sketch, Measure and Record details of an insulated pipe section.
- Position joints correctly.
- Manufacture a two piece pipe section.
- Properly swage a two piece pipe section.

1.0 Sketching and Measuring

Key Learning Points

- Sketching and measurement of training rig insulated pipe work.
- Measurement to ±2mm tolerance.
- Recording of pipe work measurement.
- Errors associated with accumulation of measurement.
- Communication through sketching.

Sketching and freehand drawing are important skills to have as a tradesman or apprentice. Most designs or job layouts are preceded by site sketches. They allow the communication of initial ideas and assist the tradesman in planning the layout of a job.

Most sketches will consist of a number of "views", that is, the same job sketched from a number of different angles. This allows the tradesman to accurately measure the job and at the same time identify any obstacles which may cause a problem later during installation.

1.1 Sketching Equipment

It is important that when you are taking a sketch that you have the right tools for the job. After all, the finished job will depend on your initial sketches. You will need the following equipment:

- Notepad – preferably a squared pad for isometric sketching..
- Pencil - a 2b pencil will allow for heavier lines for more detail.
- Eraser.
- Measuring tape.
- Circumference rule – can be used to take different angles.

1.2 Sketching a Job

1. Study the object you are going to sketch.
2. Form a mental picture of the overall object noting prominent features.
3. Decide on which views you want to sketch the job in e.g. Plan view, elevation etc
4. Begin to read less complicated features, study the job from different angles taking note of possible obstacles that may alter the final installation.
5. Read the more complicated features, use imaginary projection lines to locate surfaces and edges, and understand how they relate to the different views you want to sketch.
6. Study any detail features that are still unclear.

7. Include written notes to the sketch to clarify different aspects of the job which may still remain unclear.

1.3 Recording Measurements

When sketching a job it is vitally important that the measurements you record on the sketch are clear, concise and accurate. The measurements that you record are a form of communication for the person fabricating the parts, as they will not have seen the job and are depending on your sketch for the correct information. Some important factors to take into consideration when recording measurements onto a sketch are:

- Measurements should be shown clearly on the sketch.
- The section of the job that is measured should be indicated on the sketch using arrows showing the start point of the measurement to the finishing point of the measurement.
- When using the metric system to record measurements decide before measuring the job whether to use millimetres, centimetres or meters.
- Make a note on the sketch to indicate whether your measurements include allowances for joints, hems etc or if they have to be allowed for during the fabrication process.
- When measuring pipe work use an outside callipers to accurately measure the outside diameter of the pipe.
- If the finished job requires insulation and cladding ensure that there is sufficient space around the pipe work for the materials. Sometimes cladding may have to be manufactured in two halves so as to allow for installation.
- Ensure that your measurements are accurate as this will speed up the fabrication time and reduce costs.
- Spend time double checking your measurements and make sure you have not forgotten a measurement.
- The apprentice should always be working to a tolerance no more than ± 2mm as anything outside of this will not allow for a clean and accurate fit up of parts.

Note: It is important to note that when measuring a job that has a number of fittings and straight sections, that each of these fittings and straights should be measured individually. However when these fittings and straights sections are measured, the combined lengths should equal the overall length of the job. It is a common mistake to have an incorrect overall measure due to an accumulation of measurements.

2.0 Developing a Straight Pipe Section

Key Learning Points

- Efficient use of time and material.
- Insulation allowances.
- Circumference calculation from diameter.
- Calculation of swage and lap allowance.
- Male and female swaging.
- Rolling, fixing and swaging.

There are many considerations the apprentice or tradesman must take into account when developing a pattern on sheet metal:

- The correct material to use.
- Position of the joint line.
- Economical use of time and material.
- Swaging arrangement.
- Fit up of parts.
- Problems with fit up of parts and assembly.

We use the parallel line method of developments for developing a cylinder pipe and all other cylindrical work.

2.1 Positioning of a Joint Line

We always aim to put the joint line on the shortest side of a pattern, however the positioning of the joint is decided by a number of factors:

- Shedding of water in cladding work.
- Appearance and the overall look of the job.
- Strength of a piece.
- Nesting of materials to minimise waste.

There are many joints in sheet metal. Some joints are called self-secured joints, where we allow extra material on the pattern to form the joint. Examples are Groove joint, Slip joint, Paned joint and the lap joint. Each joint will require a different amount of metal to be added on for their assembly. It is important to allow for these joints when marking out a pattern.

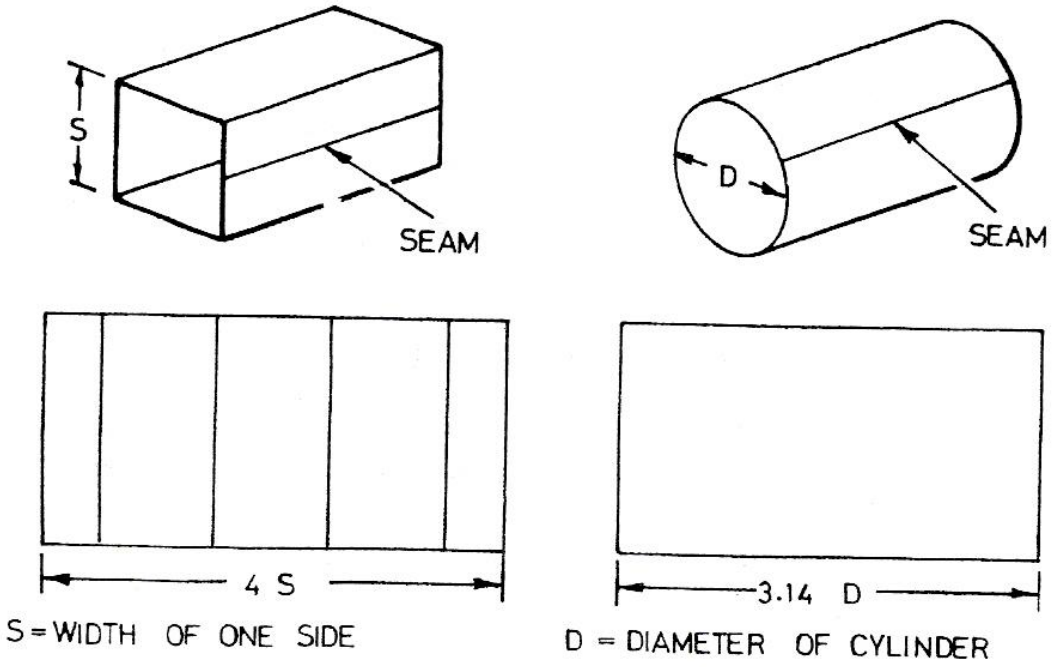
Refer to module 1 – unit 7 – section 2.0 – swaging.

Refer to module 1 – unit 6 – section 3.0 – rolling.

2.2 Parallel Line Development

The term development refers to the distance across the flat pattern or flat piece of metal before it is formed into shape. See illustration of square and cylindrical job for clarification. The development is the same as the distance round the object.

On a round pipe it would be the circumference.



Layout or development generally refers to the method of developing the lines which form the pattern. The common methods of layout or development are:

1. Parallel Line Development
2. Radial Line Development
3. Triangulation

Refer to Module 2 – unit3 – Parallel Line Development.

Refer to module 1 – unit 5 – section 1.3 – circumference of a circle.

Refer to module 1 – unit 5 – section 2.0 – measuring insulated and non-insulated pipes.

Refer to module 1- unit 5 – section 3 – allowances for cladding fabrication.

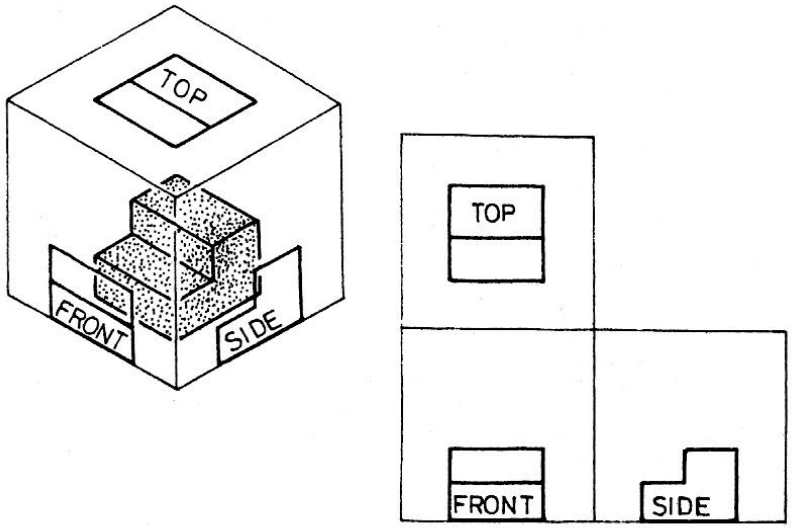
2.3 Mechanical Drawings

A working or mechanical drawing shows the exact size and shape of each side.

Note each view is what you see when looking directly at the various sides.

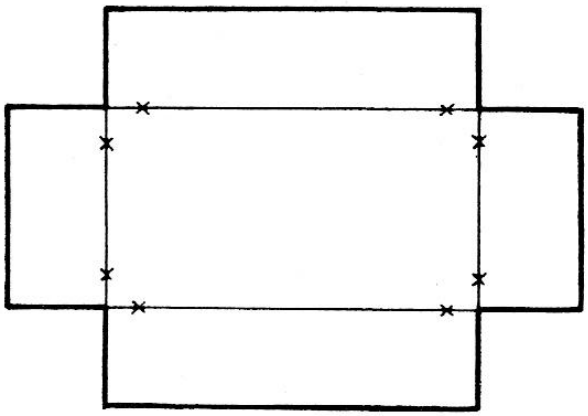
Since some of the views are alike i.e. top, bottom, front, back, right and left sides, it's only necessary to draw the number of views required to show the size and shape of the object.

In most cases this will be three; top, front and end views.



Mechanical Drawing

The term elevation means any view which shows the height of an object. The term plan view means the top view. Front elevation means front view. End elevation means end view. With this type of information, the pattern seen is easily developed.The X on the lines indicates the place where the metal is to be bent or folded. These lines are called fold lines.



3.0 Installation and Disassembly of a Cladding Pipe Section

Key Learning Points

- Disassembly of pipe cladding.
- Safe disposal of waste and sharp materials.
- Fitting of pipe cladding over insulated pipe work.
- Location of joints out of view where possible.
- Professional attitude toward finish and presentation.

3.1 Installation of Pipe Cladding

The process of installing pipe cladding over an insulated pipe takes patience and a keen eye for detail. The apprentice must develop a professional attitude towards the overall finish and presentation of the job from the start as any mistake or oversight will be seen by the customer. The following procedure should be followed when installing a section of pipe cladding:

- Check the pipe insulation to make sure there are no rips or tears in the outer foil covering or vapour barrier.
- Decide on a starting point for the installation of the cladding. This may be from a vessel or flange.
- Try in so far as reasonably possible to keep the joints hidden and out or view. This will add to the overall appearance of the job.
- When installing a round pipe section, the cylindrical pipe will have to be pulled apart to fit over the insulated pipe, so it is important that the cladding pipe is not damaged.
- Make sure that when you are fitting the cladding pipe over the insulated pipe that you d not tear the insulation of protective foil covering.
- Temporarily fix the cladding pipe in place using self tapping screws. Install the next section of pipe or fitting in place by fitting the male swage of one section into the female section of the other fitting. Secure in place using the self tapping screws ensuring that the joint is tight and free from movement.
- Check your measurements as you install each section so as to avoid a problem at the end of the overall installation. As each section is installed measurements can creep thus increasing the overall length, and make it difficult to install the final pieces.
- When the installation is complete make sure there are no finger or hand marks on the job, wipe the cladding with a soft clean cloth to remove such marks.

3.2 Disassembly of Pipe Cladding

When disassembling pipe cladding the following procedures should be followed:

- Sketch the installed job before disassembly in case the cladding has to be installed at a later stage. If possible take some photographs of the job from a number of different angles.
- Number each part making sure to mark where each section joins to the next.
- Remove all self tapping screws using a screw driver. If the joints have pop riveted, drill out the pop rivets with the same size drill bit that was used to originally drill holes. Try to avoid enlarging the holes in case the cladding has to be reused.
- Remove each section carefully trying to avoid damaging the cladding and disturbing the insulation underneath.
- Place the removed cladding in a designated storage area, if the cladding is been dumped make sure it is placed in the proper recycling bin.
- Always wear the appropriate personnel protective equipment when disassembling cladding.
- Leave the work area clean and tidy when the job is complete.

Summary

In industrial insulation, there are a number of factors which make up a complete job. The quality of materials, measuring the job correctly, pattern development, metal forming, installation and presentation. The complete installation must be functional and at the same time it must have a good appearance. The apprentice industrial insulator must develop from the start, a keen eye for detail, the ability to solve problems and only be happy when he/she has delivered a high quality job.

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