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Module 5 – Ductwork

Unit 2 – 90° Square Bend with 'S' & 'C' Cleats

Duration – 3.5 Hours

Learning Outcome:

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

- Sketch 90° square bend (front elevation, end view and pictorial)
- Mark out and fabricate 90° square bend with square heel and throat for use with ‘S’ and ‘C’ cleats
- Job planning

Key Learning Points:

<table>
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<tr>
<th>Rk</th>
<th>Parts of bend – throat, heel and cheeks.</th>
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<tr>
<td>M</td>
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<td>Sc</td>
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Training Resources:

- Toolkit
- Tools and machinery/equipment
- Workshop drawing
- Live example
- 0.6mm galvanised mild steel
- Metal manufacturer’s weight tables
- Reference library
- Safety equipment and protective clothing
- Calculator
  a. DW/143
  b. DW/144
  c. DW/TM2
  d. TR-17
  e. DW-171
  f. BS5970:2001

Key Learning Points Code:

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<th>M</th>
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Figure 1 - 90° Square Bend

NOTE:
THIS FITTING IS DESIGNED FOR
USE WITH 'S & C' CLEATS
90° SQUARE BEND - SQUARE THROAT AND HEEL
This bend is made up of 4 parts, 2 cheeks – one of which is visible from the plan. They are referred to as the left and right cheeks when looked at in the end view. The throat has the smaller dimensions, i.e. 150 x 150 and the heel is the back of the bend measuring 300 x 300 on first observations. Depending on the type of joint we may add or subtract from the above measurements.

As we are using S and C cleats the sizes are indeed 150 x 150mm and 300 x 300mm. We bend 12.5mm back as seen in the drawing to make the C cleat.

To make up the cheeks cut metal blanks 310 x 310mm. 10mm is added for the Pittsburgh lock on the heel. There is no need to add on 10mm for the Pittsburgh lock at the throat. The cheeks look like so. We notch the shaded areas which are part of the lockform joint and slit the 10mm throat were shown. We also remove 140 x 140 from the throat section.
The throat and heel wrappers are notched at both ends to suit a C cleat. We simply cut out 35 x 25mm for the lockform and bend on a line 12.5mm in from each end. To obtain area/weight of metal we multiply L x W and subtract all the notched out areas to get a more accurate answer.

This is the easiest 90° bend to make. While quick and economical the airflow is not as efficient as our next bend - a radius bend. We may put in turning vanes to help improve air flow.
The throat is notched similar only the middle changing slightly to a deeper notch as bending on the middle line is o/s instead of i/s.

We notch into the 35mm line and come out 6mm each side of the bend line approximately. This prevents a bulging of the metal in the throat section and allows for easier bending.

**Components of an Extraction Ventilation System**

1. Fan
2. Ductwork itself
3. Fittings, i.e. bends, offsets, reducers etc.
4. Grills
5. Louvers
6. V.C.D.
7. Fire dampers
8. Access doors
9. Roof curb
10. Flashing
11. Weather cap/apron
12. Roof cowl
Self Assessment

Questions on Background Notes – Module 5.Unit 2

1. What is the area of the two cheeks?

2. What % of this area is scrap? You may disregard the triangular portions if you so wish.

3. Sketch an S and C cleat giving it nominal dimensions.
Answers to Questions 1-3. Module 5.Unit 2

1.

The amount of metal used is simply:

\[ L \times B \ \text{i.e.} \ 300 \times 300 \text{mm} = 90,000\text{mm}^2 \]

2.

The major part of the scrap is the:

Throat area \(150 \times 150\text{mm} = 22,500\text{mm}^2\)

This is \(\frac{1}{4}\) of 90,000 the total area and so 25% being the same as \(\frac{1}{4}\)

Our answer is:

\[
\frac{90,000}{100} = 100\%
\]

\[
\frac{90,000}{100} = 1\%
\]

\[
\frac{900}{900} = 1\%
\]

\[
\frac{22,500}{900} = 25\%
\]
3.

Figure 1: S Cleat

Figure 2: C Cleat
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