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INSTITUTE OF APPLIED TECHNOLOGY

Mechanical Workshop

Module 4: Hacksaws

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IAT Curriculum Unit

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Module 1: Hacksaws

Module Objectives

After the completion of this module, the student should be able to:

1. Describe the basic hack sawing process.
2. Identify the parts of a hacksaw.
3. Name the parts of a saw blade.
4. Identify the correct blades that should be fitted for different materials.
5. Demonstrate how to fit and remove a hacksaw blade correctly.
6. Demonstrate the procedure used when cutting materials.
7. Identify some defects of saw blades and their causes.

Module Contents

- 1 Introduction to hack sawing.
- 2 Main parts of a Hacksaw.
- 3 Types of hacksaw frames.
- 4 Hacksaw blades
- 5 Hacksaw safety
- 6 Cutting with the hacksaw
- 7 Practical task
- 8 Worksheet

4.1 Introduction to hack sawing

Hack sawing is a process of cutting metals to size. It uses a long blade mounted in a bow-shaped frame. Cutting takes place using a reciprocating, or back-and-forth, motion as shown in Fig.4.1.



Fig.4.1: The hack sawing process.

4.2 Main parts of a hacksaw

The typical hacksaw consists of a saw blade supported by a frame fitted with a handle to give a firm grip as shown in Fig.4.2.

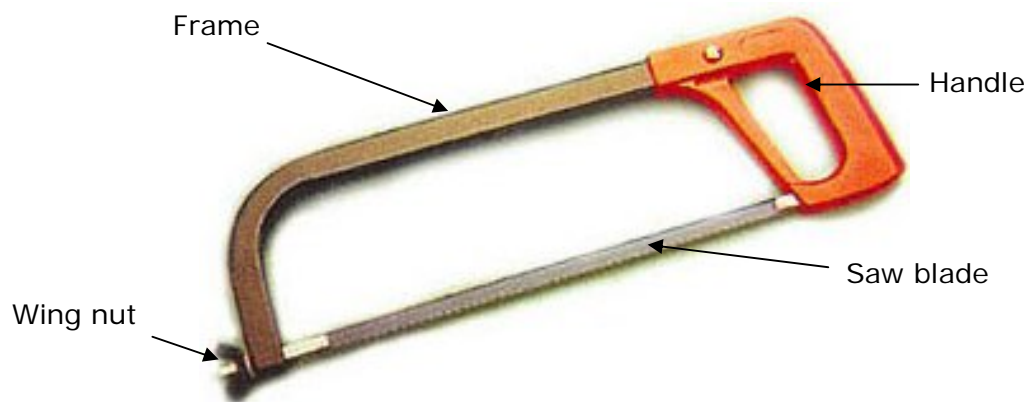


Fig.4.2 Hacksaw main parts.

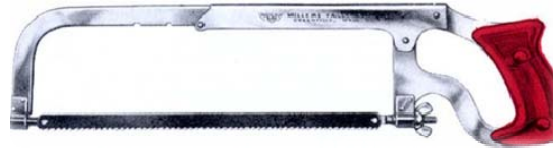
4.3 Types of hacksaw frames

There are two types of hacksaw frames:

1. Solid hacksaw frame as shown in Fig.4.3a. In this type only a particular standard length of blade can be fitted to this frame.
2. Adjustable hacksaw frame (Fig.4.3.b). In this type different standard lengths of blades can be fitted to this frame.



(a)



(b)

Fig.4.3: (a) Solid hacksaw frame.
(b) Adjustable hacksaw frame

4.4 Hacksaw blades

4.4.1 Classification of the hacksaw blades

The hacksaw blade is classified by:

1. Teeth pitch which is the number of teeth per 25 mm.
2. Blade length which is the length between the centers of its pin holes as shown in Fig.4.4.

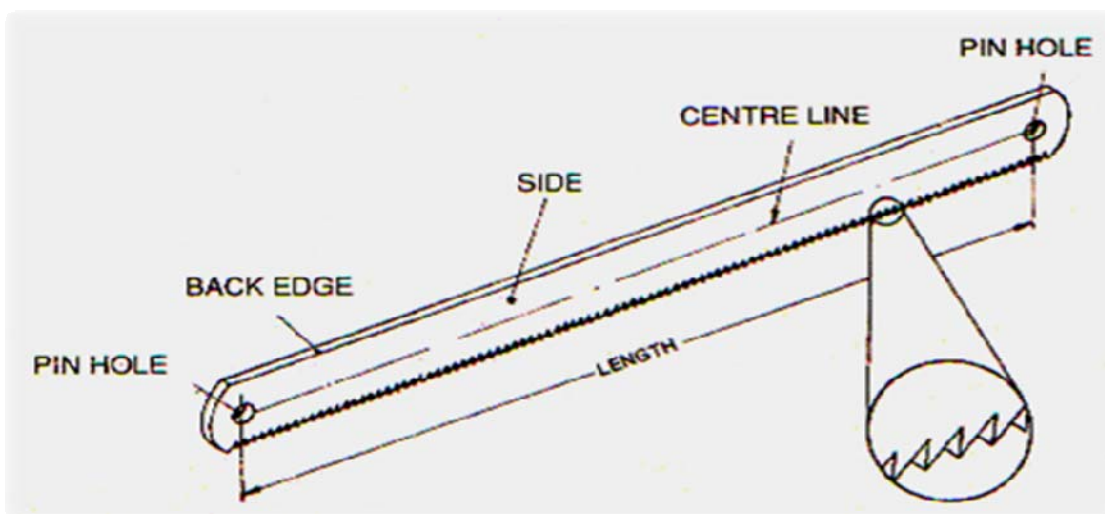


Fig.4.4: Hacksaw Blade.

4.4.2 Hacksaw blade pitch

The pitch of the hacksaw blades are classified as follows:

1. Coarse pitch teeth.

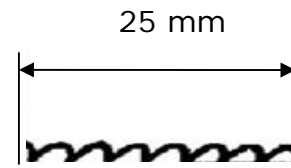
The coarse pitch blade shown in Fig.4.5a has 14-18 teeth/25 mm. It is used to cut thick and soft workpieces.

2. Medium pitch teeth.

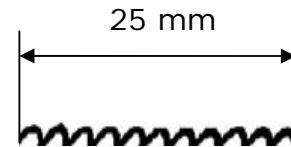
The medium pitch blade shown in Fig.4.5b has 18-24 teeth/25 mm.

3. Fine pitch teeth.

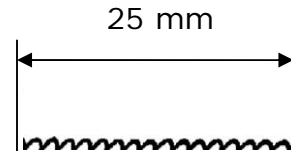
The medium pitch blade shown in Fig.4.5c has 24-32 teeth/25 mm. It is used to cut thin and hard workpieces.



(a)



(b)

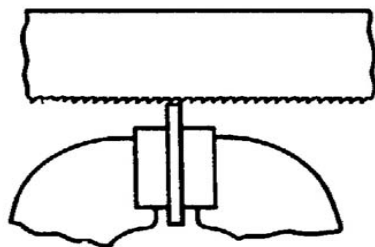


(c)

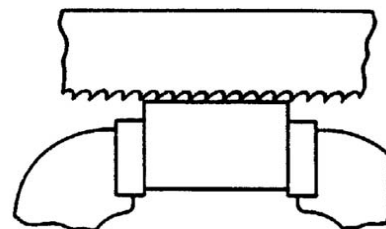
Note: A fine pitch blade has more teeth per 25 mm than a coarse pitch blade.

Fig.4.5: (a) Coarse pitch teeth. (b) Medium pitch teeth. (c) Fine pitch teeth.

A simple rule to follow when choosing a hacksaw blade in terms of the number of teeth used is explained by Fig.4.6. At least two or three teeth should be cutting all the time.



(a)



(b)

Fig4.6: (a) Thin sections more teeth. (b) Thick sections less teeth.

4.4.3 Blade setting

The teeth are set so that the blade makes a cut wider than itself. This helps to prevent the blade from jamming becoming blocked and provides for good chip clearance when cutting the metal.

The most common types of sets used are:

1. Alternate set: The teeth are arranged alternately as shown in Fig.4.7.(a).
2. Wave set: the teeth are arranged in a wave form as shown in Fig.4.7.(b).

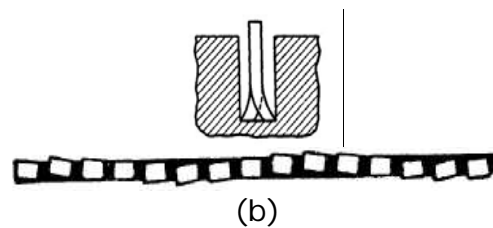
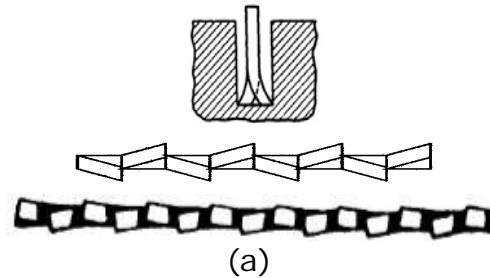


Fig.4.7 : (a) Staggered set. (b) Wave set.

4.4.4 Installing the blade in the hacksaw frame.

1. Install the teeth point away from the handle of the hacksaw as shown in Fig.4.8.
2. Tighten the wing nut until the blade is definitely under tension. This helps make straight cuts.

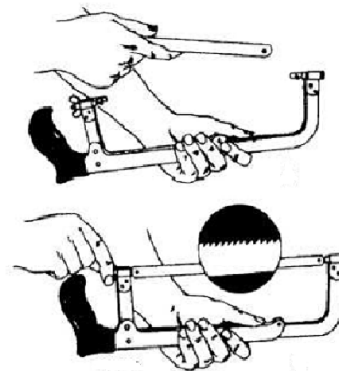


Fig.4.8: Installing the blade.

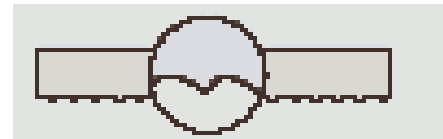
4.4.5 Saw blade defects and their causes:

1. Fast blunting (Fig.4.9a)

- If wrong teeth number is chosen.
- If saw blade is not tightened accurately.
- If pressure is too high, the teeth go blunt fast.



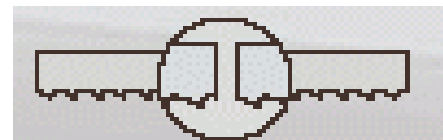
(a)



(b)

2. Teeth breaking (Fig.4.9b)

- Tooth pitch is too small (teeth number per 25mm) while cutting thin elements
- If material is not tightened well.



(c)

3. Breaking of saw blade (Fig.4.9c)

- Cutting material is not tightened properly.
- Jammed material while finishing the cut.



(d)

Fig.4.9: (a) Saw blade blunting.(b) Teeth breaking.(c) Saw blade breaking.(d) Curved cutting

4. Curved cutting (Fig.4.9d)

- Wrong fixing of blade in the frame.
- Blade is insufficiently tightened.
- Material is insufficiently tightened.

4.4.6 Hacksaw blade checklist

Before using the hacksaw take care of the following:

1. Select the correct pitch for the material you want to cut.
2. Ensure that the blade has the correct tension.
3. Ensure that the blade is not twisted or discolored.
4. Ensure that the teeth must point away from the handle.
5. Ensure that there are no broken or blunt teeth.

4.5 Hacksaw safety tips

1. Always wear safety goggles while using a hacksaw.
2. Be sure the hacksaw blade is properly tensioned.
3. Do not brush away chips with your hand; use a brush.
4. Never test the sharpness of a blade by running your fingers across its teeth.
5. Keep saw blades clean, and use light machine oil on the blade to keep it from overheating and breaking.

4.6 Cutting with the hacksaw

1. Hold the hacksaw properly at an angle as shown in Fig.4.10.
2. When cutting, let your body sway ahead and back with each stroke.
3. Apply pressure on the forward stroke, which is the cutting stroke.
4. Use the entire length of the blade in each cutting stroke.
5. The usual cutting speed is from 40 to 50 strokes per minute

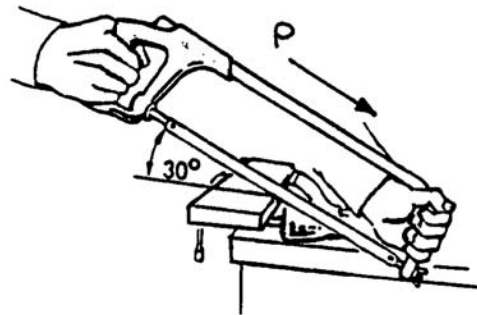


Fig.4.10: Cutting with the hacksaw.

4.7 Practical Task

4.7.1 Objective:

To cut the workpiece to produce a drill gauge according to the dimensions given (see the drill gauge project document).

4.7.2. Required Tools

SR	Tool	SR	Tool
1	Different hacksaw blades	4	Brush
2	Hacksaw frame	5	Vernier caliper
3	Vice	6	Steel ruler

4.7.3 Procedure

1. Wear the safety gear required.
2. Mount the workpiece firmly on the vice.
3. Choose the correct blade according to the type of material and thickness being cut as mentioned in table 4.1.
4. Install the hacksaw blade as explained in section 4.4.4.
5. Use the blade check list explained in section 4.4.6 to ensure proper installation.
6. Use the hacksaw to cut the workpiece as explained in section 4.6. Use the marked sawing lines shown in Fig.4.11 to guide the cutting process.

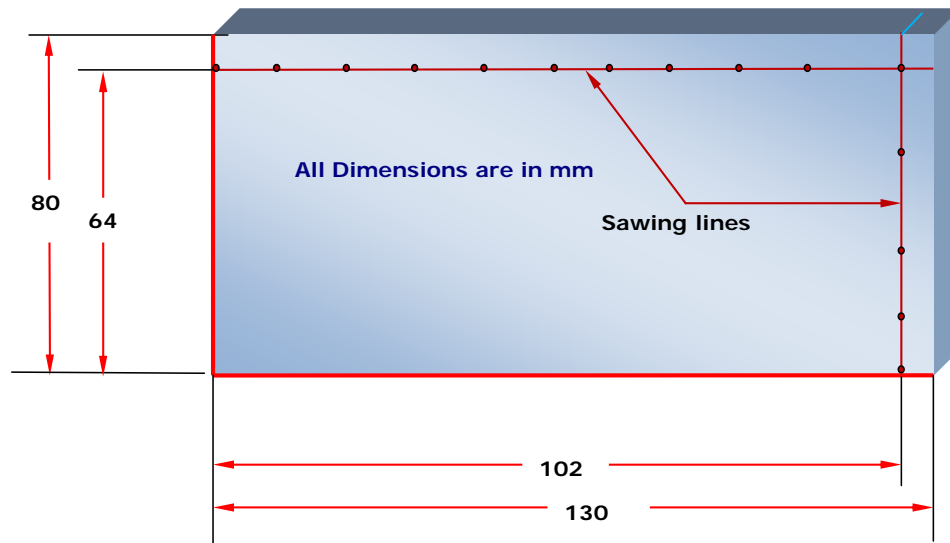


Fig 4.11: The sawing lines.

4.8 Assignment

Visit your classroom Blog created by your instructor and comment on the following topics:

1. Power saw
2. Band saw.
3. Circular saw.

Mention one real life application for each of them.

Student's notes

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Worksheet

1. Circle the most correct answer:

1. Which of the following saw blades is coarse pitch teeth?
 - a) 32 teeth per 25 mm.
 - b) 18 teeth per 25 mm.
 - c) 14 teeth per 25 mm.
2. Which of the following saw blades is fine pitch teeth?
 - a) 32 teeth per 25 mm.
 - b) 18 teeth per 25 mm.
 - c) 14 teeth per 25 mm.
3. The pitch of saw blades is expressed as:
 - a) The length from hole-to-hole centre of the blade.
 - b) The material of the blade.
 - c) The number of teeth per linear inch.
 - d) None of the above.

2. Fill in the blanks

1. A hacksaw cuts best at about _____ to _____ strokes per minutes.
2. At least _____ or _____ teeth should be cutting all the time.
3. Blade setting helps to prevent the blade from _____ when cutting the metal.
4. Hacksaws cut on the _____ stroke, not on the _____ stroke.
5. A _____ pitch blade has more teeth per 25 mm than a coarse pitch blade.

3. Answer the following questions:

1. Name the parts shown by the arrows.



2. Why should the work be mounted firmly and close to the vise before cutting with a hacksaw?

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3. List three safety precautions that should be observed when using hacksaws.

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4. Mention two methods of hacksaw teeth setting.

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5. Mention three websites that are useful in explaining different types of saws.

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