



معهد التكنولوجيا التطبيقية
INSTITUTE OF APPLIED TECHNOLOGY

Mechanical Workshop

Module 5: Files

PREPARED BY

IAT Curriculum Unit

January 2010

Module 5: Files

Module Objectives

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

1. Identify the parts, types and different grades of files.
2. Describe the different methods of filing.
3. Explain the use of the file safe edge and the file card.
4. Demonstrate an ability to file correctly and safely in a number of workshop tasks to varying degrees of accuracy.

Module Contents

No.	Topic	Page
1.	Files	3
2.	Identifying files	3
3.	Shapes of file	4
4.	Grades of file	6
5.	Cut pattern	7
6.	How to file	8
7.	Methods of filing	8
8.	Safe edge	9
9.	File card	10
10.	Safety and Care of Files	11
11.	Practical task	12
12.	worksheet	15

5.1 Files

A file is a metalworking and woodworking tool used to cut fine amounts of material from a workpiece. It most commonly refers to the hand tool style, which takes the form of a steel bar with a series of sharp, parallel ridges, called teeth. Most files have a narrow, pointed tang at one end to which a handle can be fitted Fig. 5.1.



Fig 5.1: File

5.2 Identifying files

To identify a file it is necessary to know the following:

1. The length (measured from the point to the shoulder).
2. The shape of the file (the cross-sectional profile).
3. The grade the spacing and pitch of the teeth (smooth, second and coarse).
4. The type of cut or the patterns of cutting edge (single, double and rasp).

Hence Files are categorized according to Length, Shape, Grade and Cut Patterns. File main parts are shown below in Fig. 5.2.

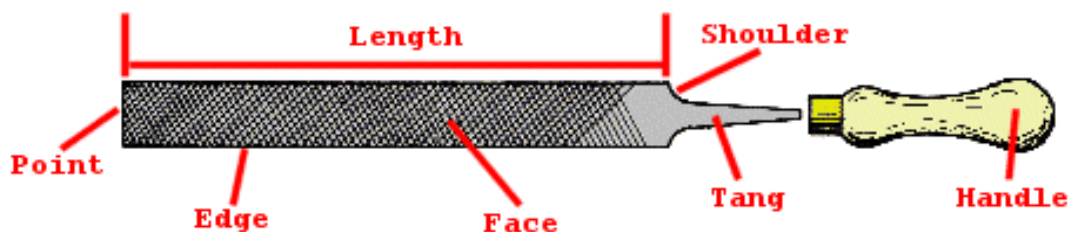


Fig. 5.2: File parts.

5.3 Shapes of files

Files come in different shapes for carrying out different jobs. Some

shapes include:

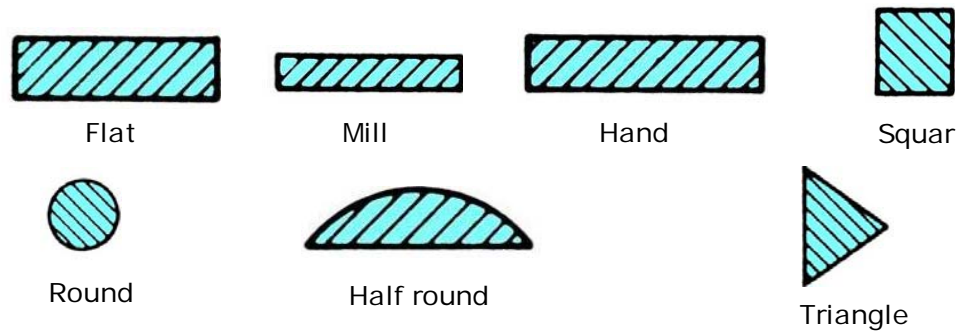


Fig. 5.3: file shapes.

1. Hand File is the common file used for roughing and finishing. It is a rectangular in section and parallel in width. It has double cut teeth on two faces, single cut teeth on one edge, and one safe edge (Fig. 5.4).



Fig. 5.4: Hand file

2. Flat File - is similar to a hand file rectangular in section, tapered slightly in width and thickness towards the tip. It has double cut teeth on two faces and Single Cut teeth on two sides (see Fig. 5.5).



Fig. 5.5: Flat file

3. Half-round File - its cross-section is a chord of a circle with its taper towards the tip. It is used for forming radii, grooves, etc. The flat side is used for finishing flat surfaces (Fig. 5.6).



Fig. 5.6: Half-round file

4. Mill files- are suitable as a sharpening file. Mill files are the best

choice for filing where a smooth finish is important. Also good for polishing and deburring work in lathes. Mill files (Fig. 5.7) are widely used for sharpening tools. Two square edges. Single cut on sides and edges. All sizes slightly tapered in width.



Fig. 5.7: Mill file

5. Round File – it has a round cross-section tapering toward the end (Fig. 5.8). It is used for enlarging holes and producing internal round corners. Usually double cut in the larger sizes, and single cut for the smaller sizes.



Fig. 5.8: Round file

6. Square File - is square in section and tapered towards the tip, usually double cut on all four faces (Fig. 5.9). It is used for filing rectangular slots or grooves.



Fig. 5.9: Square file

7. Three Square File - is also known as triangular file (Fig. 5.10). This is triangular in section, and tapered towards the tip with double cut on both faces. It is used for filing corners or angles less than 90°.



Fig. 5.10: Three square file

8. Needle Files - Needle files are a set of small files with their shapes made in

a way similar to the large ones mentioned above (Fig. 5.11). They are generally used for small and delicate works such as the repair of small instruments.



Fig. 5.11: Needle file

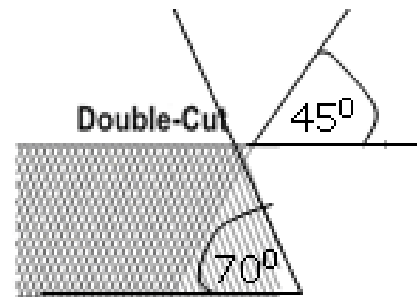
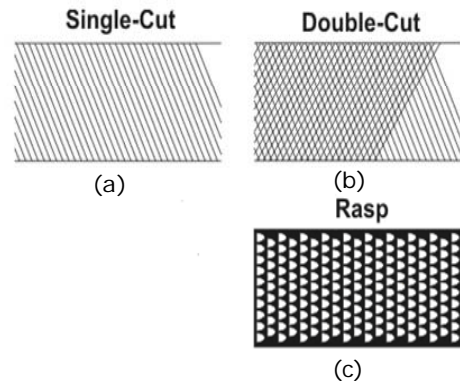
5.4 Grades of files

Three grades of cut are in common use:

a) Single Cut - There is only one set of cutting teeth to one edge. It gives a less efficient cutting but better finish. It is suitable for soft metals (Fig. 5.12b).

b) Double Cut - A double cut file has one set of teeth cut at 70 degrees to one edge, and another set of grooves cut at 45 degrees to the other edge (Fig. 5.12 d). It is thus more efficient in cutting. It is easy to clog the teeth when it is work on the soft metal (Fig. 5.12a).

c) Rasp - Very coarse teeth, like the nail, it is commonly used for the cutting off soft materials such as rubber, PVC, wood, etc (Fig. 5.12c).



(d)

Fig. 5.12: (a) Single cut file (b) double cut file (c) Rasp file (d) double cut file teeth angles

5.5 Cut Pattern

Files are also classified according to the coarseness of the teeth. This refers

to the pitch (spacing) of the teeth that spread throughout the whole length of the file. Files with a rougher grade of cut give a faster metal removal rate but a poorer surface finish or the vice versa. It should be noted that, for the same grade of cut, a longer file would have a coarser pitch than a shorter one.

a) *Bastard cut* - medium teeth for general purposes, especially suitable for mild steel (Fig. 5.13)

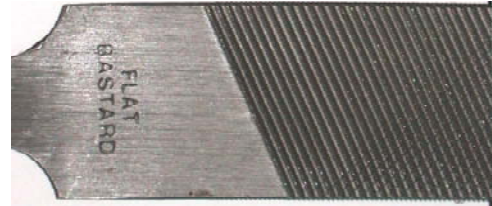


Fig. 5.13: Bastard cut file

b) *Second cut* - finer teeth for cutting hard metal (Fig. 5.14).



Fig.5.14: Second cut file

c) *Smooth cut* - fine teeth for finishing (Fig. 5.15).



Fig. 5.15: Smooth cut file

5.6 How to File.

To obtain a good surface finish and accurate dimension for the finished workpiece you should follow the steps below:

- 1- Select a file that is best for the job.
- 2- Clean the file out with a stiff wire brush.
- 3- Clamp the workpiece in the vice.
- 4- Take the correct filing position as shown in Fig. 5.16.
- 5- Grab the handle of the file with the dominant hand and place the palm of the other hand on the end of the file (Fig. 5.17). Orient the file so that it points away from you. Press down firmly, and make long slow strokes away from your body. Remove downward pressure on the return stroke to prevent dulling the file.

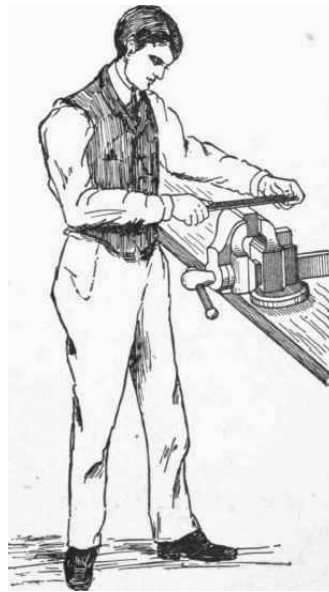


Fig. 5.16: Bench filing position

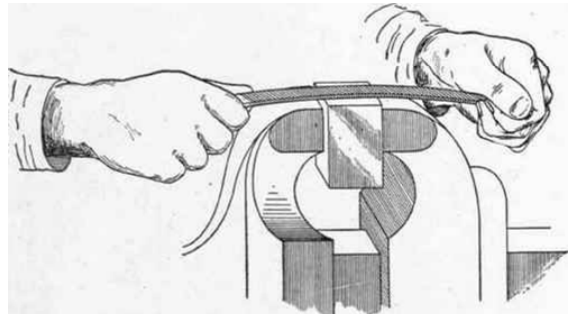


Fig. 5.17. Bench filing.

5.7 Methods of filing

1- Cross filing

The workpiece is first filed in one direction and then filed again at an angle to the original strokes (Fig. 5.18).

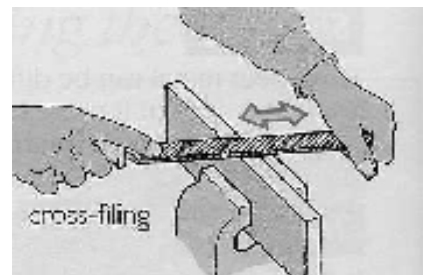


Fig. 5.18: Cross filing.

2- Draw filing

This method is only used to remove file marks and produce a good finish on completed work. A smooth file is used to produce a good finish. This finish can be improved further by rubbing chalk into the file. This prevents the teeth from clogging (Fig. 5.19).

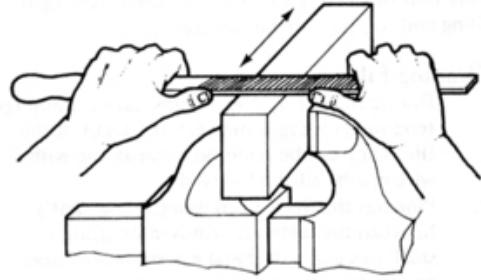


Fig. 5.19: Draw filing.

3- Filing Curves

There are two types of curves that you may have to file smooth. With an internal curve, you should move the file across the work while at the same time moving along the curve. As you are moving the file along the curve change the angle of the file (Fig. 5.20). For an external curve, run the file along the curve while at the same time "rocking" the file so that the point of the file rises as you can see in Fig. 5.21.



Fig. 5.20: Filing internal curve.

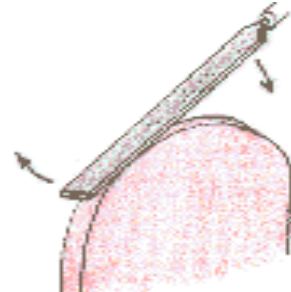


Fig. 5.21: Filing external curve.

5.8 Safe Edge

There are no cutting edges on one side of the hand file (Fig. 5.22). The purposes for the safe edge is to avoid the worker damage the work, when he is filing a shoulder position. Shape of Files. Fig. 5.23 illustrates how to use the safe edge of the file.

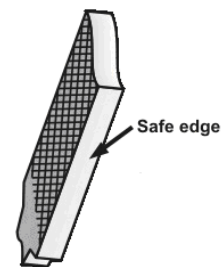


Fig. 5.22: Safe Edge.

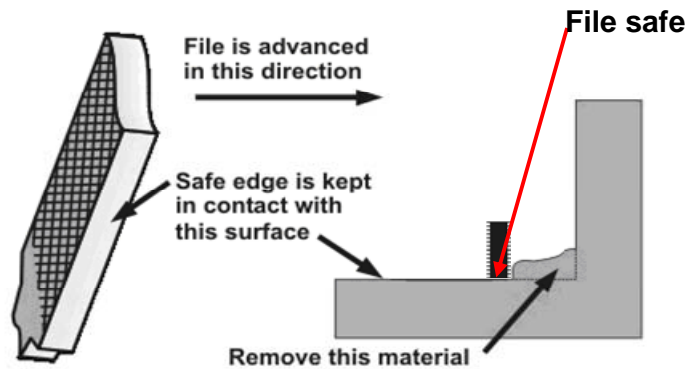


Fig. 5.23: File safe edge in use.

5.9 File Card

When filing the soft metals, the small pieces of metal will tend to clog the teeth. If the file is not cleaned, these small pieces of metal will scratch on the surface of the work. This is called pinning. This case is frequently appeared when applying a new smooth file on soft metals. The pinning can be removed with a File Card (Fig 5.24) which is a wire brush mounted on a block of wood. Sweep the file card along the grooves on the file until the pinning is removed.



Fig 5.24: File card

5.10 Safety and Care of Files

1. Never use a file without or with cracked or unsecure hand file
2. Files teeth are brittle and therefore file should be placed properly and should not be stacked on other tools.
3. Remove the pinning regularly by a file card/wire brush.
4. Use only light pressure.

Don't just throw your files in a drawer. Care should be taken to keep each file separate. Keep them in a rack or drawer with partitions (Fig.5.25).

6. Use a piece of cloth, not your hand to clean the surface being filed.
7. Never hammer on or with a file.
Don't clean a file by slapping it on the bench; since it is brittle it may shatter.
9. Be sure to keep files away from water or moisture and avoid getting them oily. Oil makes the file slide across the work surface without cutting.



Fig. 5.25: Files are kept in a drawer

5.11 Practical Task

5.11.1 Objectives

To file the workpiece as far as the marking out line to produce a drill gauge according to the dimensions given (see the drill gauge project document)

5.11.2. Required tools

No.	Tool
1.	Bastard cut file
2.	Second cut file
3.	File Card
4.	Vernier caliper
5.	Radius gage

5.11.3. Procedures

- 1- Deburr the workpiece after sawing as shown in Fig 5.25.
- 2- File the workpiece as far as the 1st mm using the *bastard cut file*.
- 3- Use engineer's square and Vernier caliper to check the workpiece dimensions.
- 4- Repeat the previous two steps until the width of 60.5 mm is obtained.
- 5- File off more 0.5 mm using the *second cut file*.
- 6- *Deburr and check using* engineer's square and Vernier caliper.
- 7- Oil all surfaces of the finished workpiece (Fig 5.26) to protect it from rust until next use for drilling.

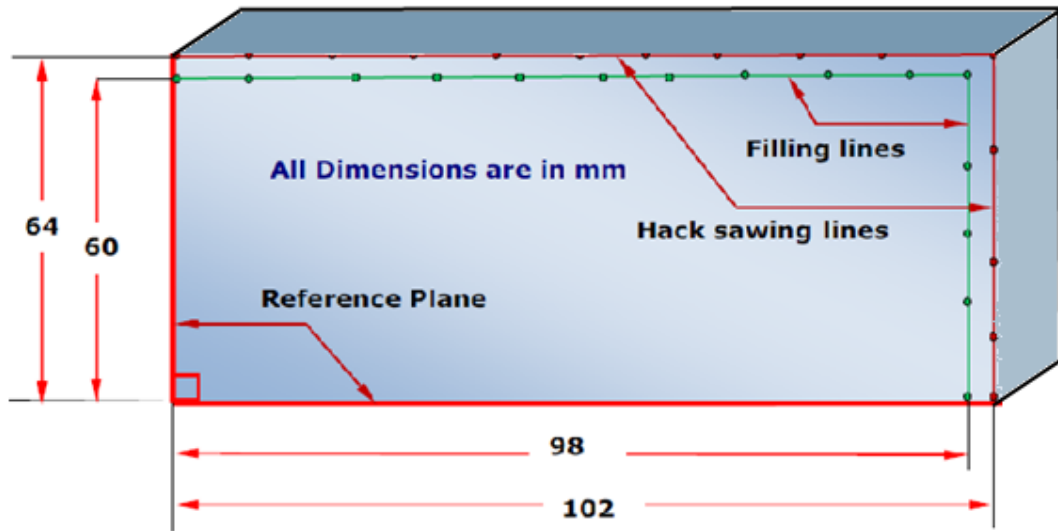


Fig 5.25: Workpiece after sawing

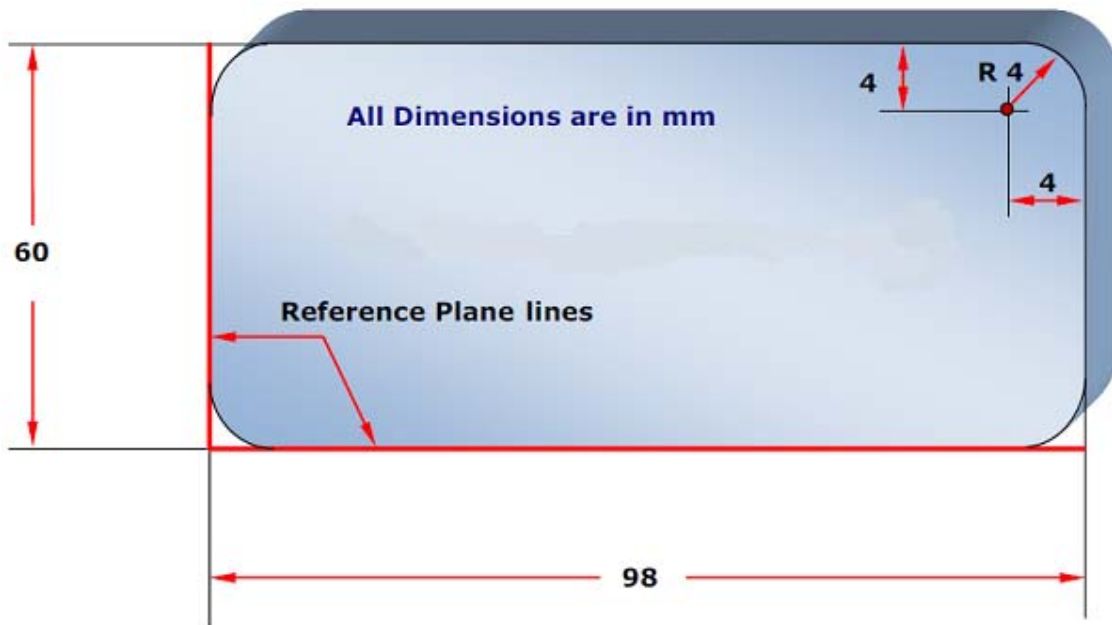


Fig 5.26: Finished workpiece

Student Notes

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

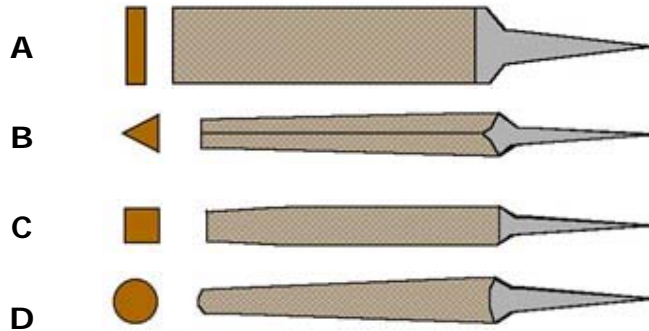
.....

.....

Worksheet

1. Choose the correct answer.

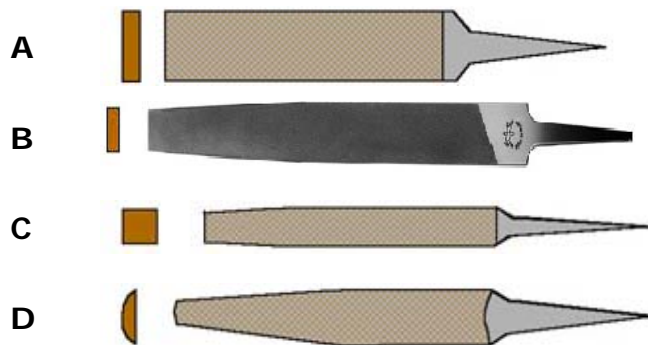
1. Which file of the following is used for filing corners or angles less than 90°?



2. Files are categorized according to Length and _____.

- A** Shape
- B** Grade
- C** Cut patterns
- D** All of the above

3. Which one of the following files is used for filling internal and external curves?



4. Which of the following file grades is commonly used in the workshop?






- a** single cut file
- b** double cut file
- c** rasp file
- d** all of the above

5. The purposes for the safe edge is to avoid the _____.

- a** damage of the file handle
- b** damage of the file teeth
- c** damage of the workpiece
- d** damage of the file tip


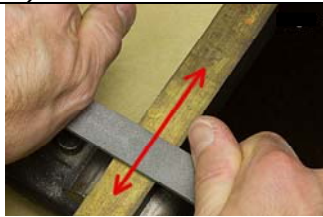




2. Match the pictures in column B with their correct names in column A, Write your answer in the box below?

Column A	1	2	3	4	5
Column B					

Column A	Column B
1) Half round file	 A)
2) Needle file	 B)
3) Square file	 C)
4) Triangular file	 D)
5) Round file	 E)

3. Match the items in column B with their correct names in column A, Write your answer in the box below?

Column A	1	2	3	4	5	6	7	8
Column B								

Column A	Column B
1) File card	 <p>A)</p>
2) Hand file	 <p>B)</p>
3) First cut file	 <p>C)</p>
4) Second cut file	 <p>D)</p>
5) Bastard file	 <p>E)</p>
6) Draw filing	 <p>F)</p>