



ثانوية التكنولوجيا التطبيقية
Applied Technology High School

Mechanical Workshop

Module 5: Files

PREPARED BY

Academic Services

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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 a metal workpiece as per the given dimensions.

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5.1 Introduction to files

The file is defined as a steel hand tool with small sharp teeth on some or all of its surfaces; used for smoothing metal or wood. Figure 5.1 shows a hand metal file



Fig 5.1: File

5.2 Identifying files

The following points should be taken in consideration when identify any file

1. The length of the file (measured from the point to the shoulder).
2. The shape of the file (the cross-sectional profile).
3. The 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 could be categorized according to Length, Shape, Pitch and Cut Patterns. Fig. 5.2 illustrates the file main parts.

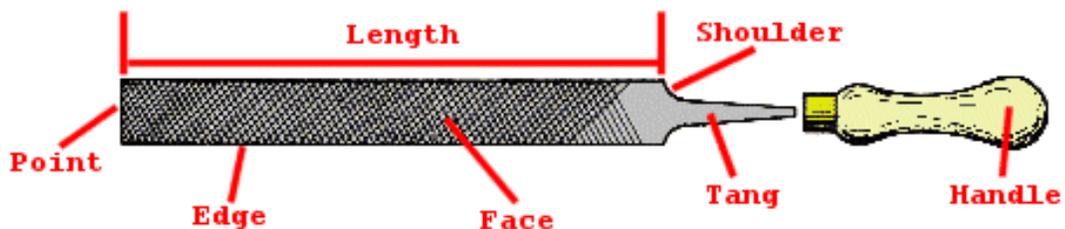


Fig. 5.2: File parts.

5.3 Types of files

1. Hand Files: Hand files are commonly used for roughing and finishing with a rectangular shape and parallel in width. These files have also double cut teeth on two faces or single cut teeth on one edge, and one safe edge (Fig. 5.4).



Fig. 5.4: Hand file

2. Flat Files: Flat files are similar to hand files rectangular in section, tapered slightly in width and thickness towards the tip. Flat files have 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 Files: The cross-section of the half round files 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: Mill files can be used on tools where fast metal removal is required. Mill files (Fig. 5.7) are widely used for sharpening tools. Two square edges with single cut on sides. All sizes slightly tapered in width.



Fig. 5.7: Mill file

5. Round Files: Round files have a round cross-section tapering toward the end (Fig. 5.8). Round files are used for



enlarging holes and producing internal round corners. Usually double cut in the larger sizes and single cut in the smaller sizes.

6. Square Files: Square files have a square cross-section and tapered towards the tip. These files usually come in double cut on all four faces, and used for filing rectangular slots or grooves (Fig. 5.9).

7. Three Square Files (Triangular file) These files are triangular in section and tapered towards the tip with double cut on both faces (Fig. 5.10). They are used in filing corners or angles less than 90°.

8. Needle Files - Needle files are a set of small files with 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 repairing small instruments.

Fig. 5.8: Round file



Fig. 5.9: Square file



Fig. 5.10: Three square file

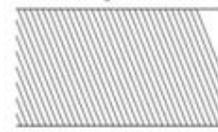


Fig. 5.11: Needle files

5.4 Grades of files

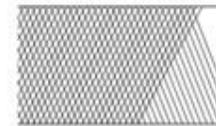
According to the types of cut, files could be classified into three grades:

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



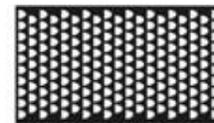
(a)

b. Double Cut: Double cut files have two series of parallel teeth running diagonally across the width of the file surface with one series crossing the other (Fig. 5.12 b). These files are best suited for rapid removal of material



(b)

c. Rasp files: These files have large and coarse teeth as shown in (Fig. 5.12c). It is commonly used in cutting off soft materials such as rubber, PVC and wood.



(c)

Fig. 5.12:

(a) Single cut file

(b) double cut file

(c) Rasp file

5.5 Cut Pattern

Files are also classified according to the coarseness (roughness) 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 cutting give a faster metal removal rate but a poorer surface finish.

a) Bastard cut: medium teeth for general purposes especially for mild steel (Fig. 5.13)

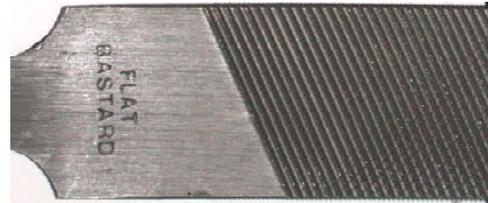


Fig. 5.13: Bastard cut file

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 and polishing (Fig. 5.15).



Fig. 5.15: Smooth cut file

5.6 How to do Filing

To obtain a good surface finishing and accurate dimension for the finished work piece, you should consider the following steps:

- 1- Select the proper file that is best for the job.
- 2- Clean the file out with a stiff wire brush.
- 3- Clamp firmly the work piece 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).
- 6- Orient the file so that it points away from you.
- 7- Press down firmly, and make long slow strokes away from your body.
- 8- Remove downward pressure on the return stroke to prevent dulling the file.

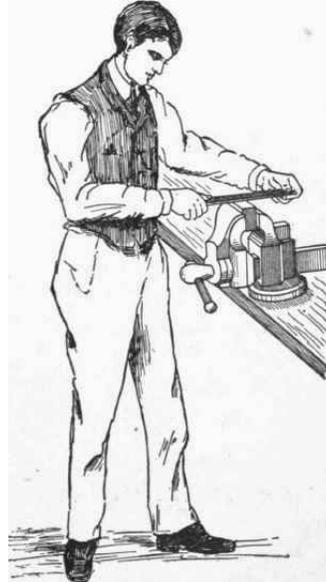


Fig. 5.16: Bench filing position

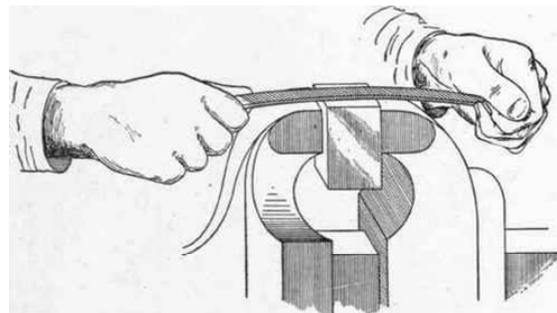


Fig. 5.17. Bench filing.

5.7 Methods of filing

It is important to make sure that the material to be filed is softer than the file itself; so hardened steel should not be filed with a hardened steel file as this might cause quick file ruination.

1- Cross filing

The work piece is first filed in one direction and then filed again at a certain angle to the original strokes (Fig. 5.18).

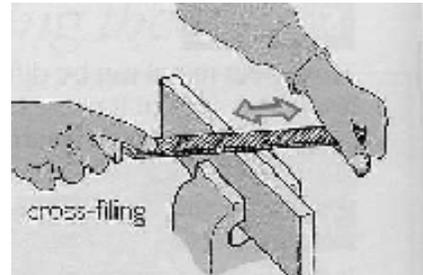


Fig. 5.18: Cross filing.

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).

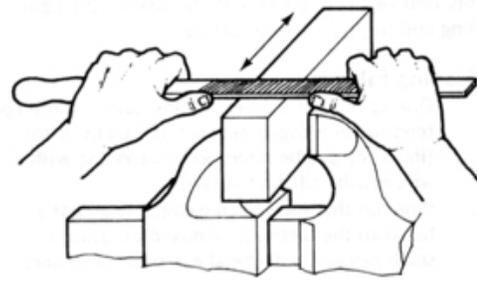


Fig. 5.19: Draw filing.

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.

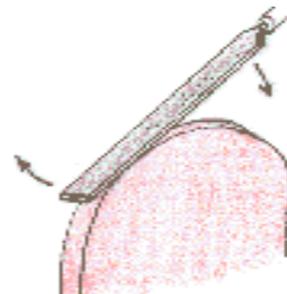


Fig. 5.21: Filing external curve.

5.8 Safe Edge

There are no cutting teeth on one side of the hand file (Fig. 5.22.a). This is extremely useful when filing in corners as shown in the (Fig5.22.b). The safe edge is placed into the corner and because it is smooth it does not damage the surface of the metal.

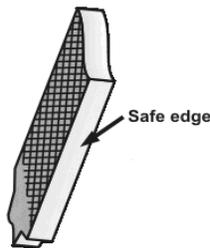


Fig.5.22.a Safe Edge

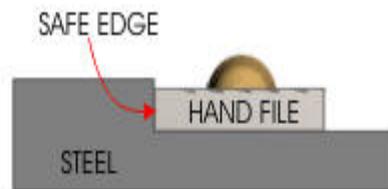


Fig. 5.22.b Placing the safe edge

5.9 File Card

When filing the soft metals, the small particles of metal will tend to clog the teeth and this is called **pining**. If the file is not cleaned, these particles will scratch on the surface of the work. 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.

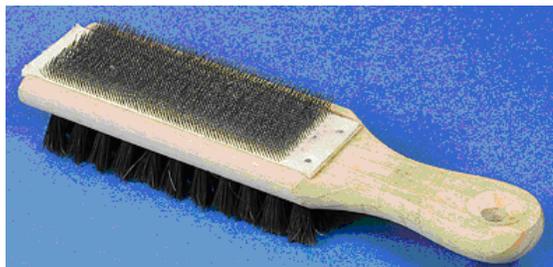


Fig 5.24: File card

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.
5. 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 as shown in 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.
8. 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

The main objective of this task is to file the work piece as far as the marking out line to produce a drill gauge according to the given dimensions (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- Smooth the work piece after sawing as shown in Fig 5.25.
- 2- File the work piece as far as the 1st mm using the **bastard cut file**.
- 3- Use engineer's square and Vernier caliper to check the work piece 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- File and check using engineer's square and Vernier caliper.
- 7- Oil all surfaces of the finished work piece (Fig 5.26) in order to avoid rusting until next use for drilling.

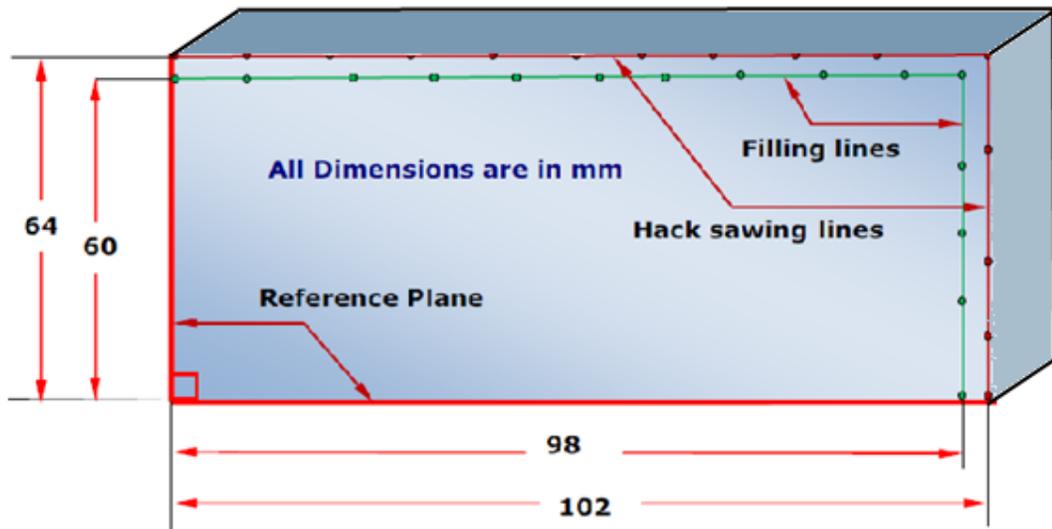


Fig 5.25: Work piece after sawing

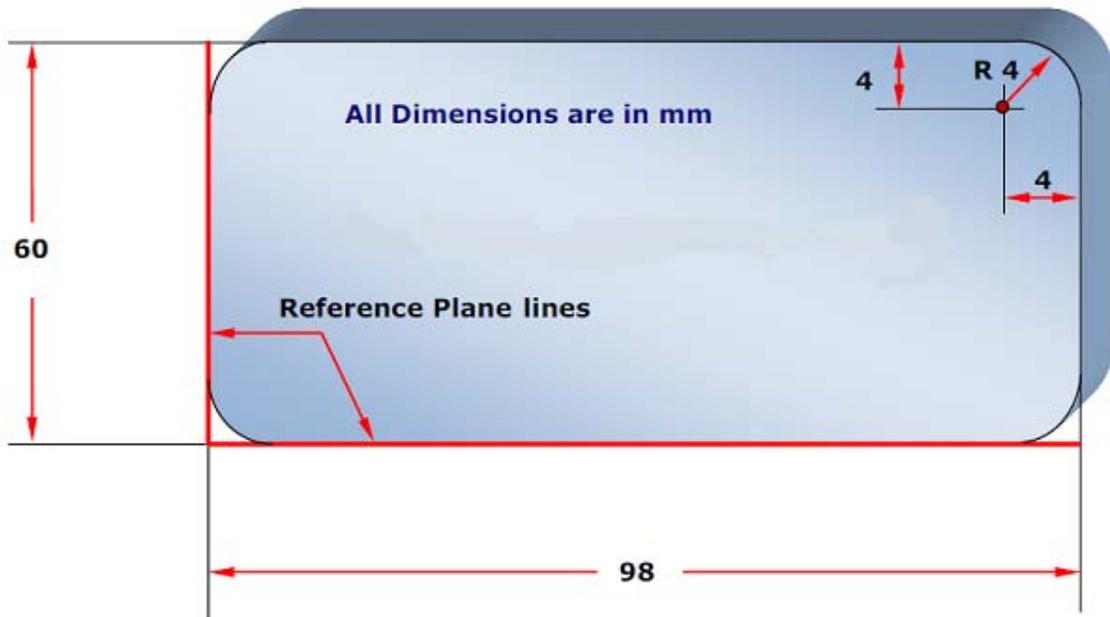
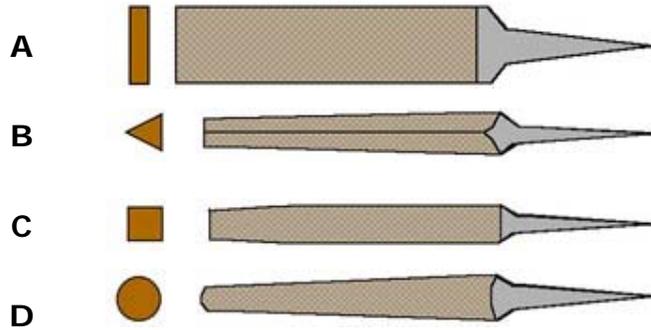


Fig 5.26: Finished work piece

Worksheet

1. Choose the correct answer.

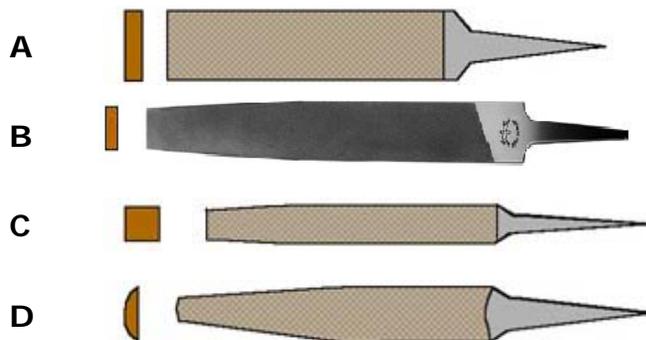
1. Which file of the following is used for filing corners or angles less than 90°?



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 one 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 purpose 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

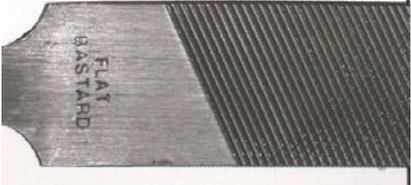
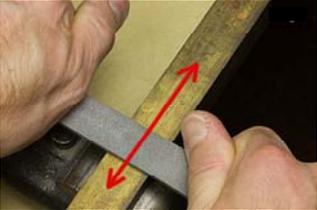
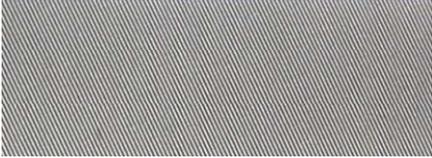
2. Match the pictures in column B with their correct names in column A, Write your answer in the box below?

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	A	
2	Hand file	B	
3	First cut file	C	
4	Second cut file	D	
5	Bastard file	E	
6	Draw filing	F	