

Use Hand Tools, Power Tools/Hand Held Operation and Carry Out Mechanical Cutting

(CLUSTER MEM18.1C & 18.2B / 5.5B / 1)
(Light and Heavy Metal Fabrication Version)

LEARNING RESOURCE

TRAINING AND EDUCATION SUPPORT
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Use Hand Tools MEM18.1C
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Carry Out Mechanical Cutting MEM5.5B

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FEEDBACK

We value your opinion and welcome suggestions on how we could improve this
resource manual. Keep in mind that the manual is intended to help students
learn and is not a text book.

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THEORY LESSONS

INTRODUCTION - Hand Tools

Tools are common place in our lives today and it is easy to overlook that they can cause injury in untrained hands. With the introduction of the Occupational Health and Safety Act all tools are manufactured with the operator's safety in mind. Some hand tools are common to a number of occupations while others are generally only used in specific fields. As a number of common hand tools are used across a broad range of occupations and trades in manufacturing and engineering it is important that people learn their purpose. It is also necessary to know how to select and safely use them for a given task. Quality hand tools are often expensive so it is also important that the user know how to properly maintain them.

Hammers

Hammers are impact tools used to impart a force either directly or indirectly through another tool such as a chisel or punch to a workpiece. The most common hammers used by the mechanical tradesperson are the ball pein (engineers), cross pein and soft faced hammers.

Ball Pein Hammers

The Ball Pein or engineers hammer is the most common of the hammers used by mechanical tradespeople. It has a convex face for striking tools such as punches, chisels, centre punches or the workpiece itself. The opposite end of the hammer head is a hemispherical ball pein used to dome or shape the shanks of rivets or to stretch the surface of a metal workpiece to straighten it.

All hard faced hammers are made from tool steel by a drop forging process.

After forging, the hammer is carefully heat-treated so that the face and the pein are hardened and tempered while the metal around the eye is left soft.

Because the hammer head has been heat-treated it must not be subjected to high temperatures, otherwise the hardness of the face and pein will be lowered.

The engineer's hand hammer is made in a range of sizes. The smallest weighs around 100g and the largest 1500g. The hammer size best suited to a fabricator's work weighs about 600g while a 200g hammer would suit most marking-off purposes.



Figure 1: Ball Pein Hammer

The weight of the hammer must be chosen to suit the job. For example, where a heavy blow is required in a confined space, a heavy hammer should be used because its large mass will be able to deliver a large amount of energy to the workpiece or tool without being made to move fast. But for normal conditions the heavy hammer would be too tiring to use.

The hammer handle should be in good condition and of a size that is comfortable to use. It should be square with the head and fit tightly into the head.

The hammer should not be used if either the head or the handle is damaged, because a burred or chipped head will cause injury if it hits the hand holding a tool such as a chisel, while a split handle may injure the hand holding the hammer.

Cross Pein Hammers

This is a special purpose engineering hammer that comes in a variety of masses up to 450 g (1 lb). The cross pein hammer is used in confined spaces or for straightening or stretching when the metal is peined at right angles to the direction of stretch or curve



Figure 2: Cross Pein Hammer

Cutting Tools

Chisels

Cold chisels are forged from medium carbon steel. Only the point of the chisel is hardened and tempered, the body being left soft. If the head of the chisel were hard it would chip or shatter as a result of hammer blows.

The point of the chisel is formed into a cutting edge. This cutting edge is similar in nature to other cutting edges in that it requires the edge to be sharp.

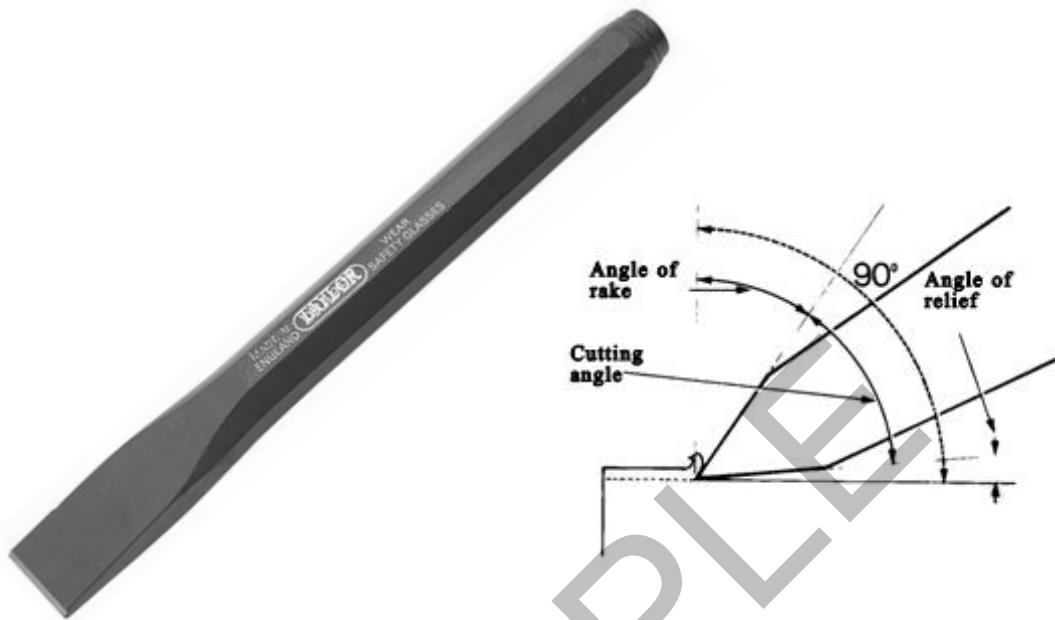


Figure 3: Cold chisel and diagram of correct cutting angle and position

Because chisels are subjected to continual impact loads, they are likely to show signs of metal fatigue or cracking after a period of use. In this condition they will become dangerous as small pieces of metal or splinters may fly off at high speed causing injury to the operator or to people standing nearby.

A new chisel should be used lightly until it is proved to be sound and only then should heavy blows be used on it.

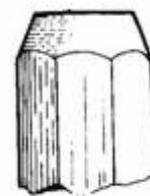
A major problem associated with the use of chisels is the mushrooming of the head due to the fact that the head is soft and the constant hammering on the head distorts the metal as shown in Figure 4a. The head of the chisel should be kept in good repair by keeping the chamfer ground cleanly as in Figure 4b.

Mushroom Head

Grind Head along dotted lines



Figure 4a: Mushrooming of Head



Correctly prepared Chisel head

Figure 4b: Restored Chisel Head

When resharpener a chisel care must be taken not to raise the temperature of the cutting edge above the tempering temperature. Ideally when grinding a chisel cutting edge no colour should show on the surface but a very light straw colour would not reduce the hardness of the chisel edge.

Chisel Types

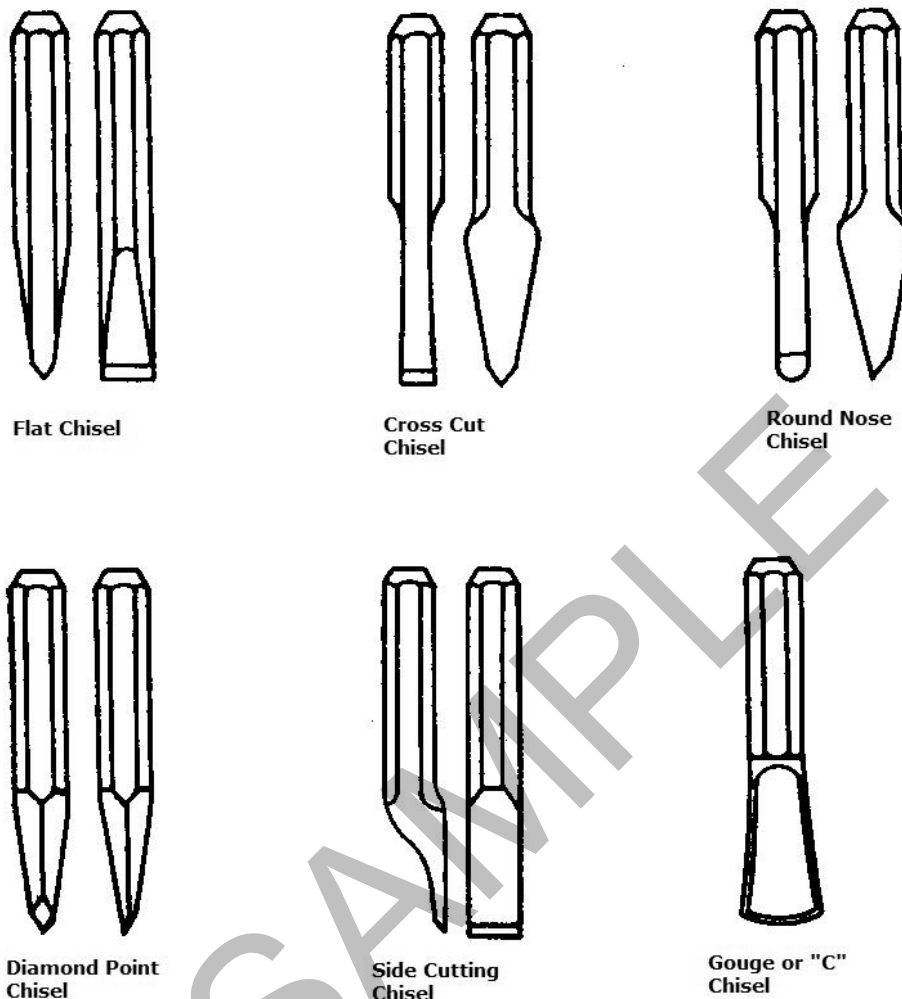


Figure 5: Six common chisel shapes

Unsafe or Faulty Hand Tools

Damaged Hand Tools

Chisels, wedges and drift pins are impact tools and from constant use these tools form mushroom heads if not maintained. An impact tool must be kept free of mushroom heads as they will cause injury to the user or to others as the head will eventually shatter on impact causing metal fragments to fly off in any direction.