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DIESEL MECHANIC

MINING QUALIFICATIONS AUTHORITY

CODE: MDG

SHARPEN A DRILL

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TRG 9

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INDEX

The following elements are contained in this learning guide:

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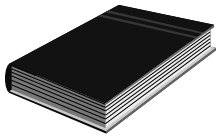

SOURCE REFERENCES

Training video : Use Hand Tools Part 2

Demonstration by a competent person, e.g. Training Officer

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OBJECTIVE

You will be learning towards the outcome “Sharpen a drill”. Whilst learning towards the outcome you will be required to achieve the following:

- Sharpen high speed steel twist drill.

On completion of this module, the learner must be able to:

- Use a pedestal grinder and the appropriate table of drill point angles to sharpen a high speed steel twist drill for drilling mild steel.

During this process you must adhere to certain specified requirements as listed in the Module.

ASSESSMENT AND EVALUATION CRITERIA

You will be assessed, when you are confident that you may achieve the outcomes as listed, to determine your competence as measured against the required criteria. This assessment will be in line with accepted best practices regarding assessment.

- A practical assessment will be set at the end of the module and must be completed without using reference other than a table for drill point and lip angles.
- The learner will be required to sharpen a blunt high speed steel twist drill for drilling mild steel.
- The following standards must be achieved:
  - The point angle of the drill must be according to the gauge.
  - The clearance angles must comply with the list of angles supplied.
  - The lip lengths must be equal.
- All the appropriate safety rules pertaining to grinding must be adhered to.

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DICTIONARY

Spindle : Pin or axis that revolves or on which a thing revolves.

Tungsten : Steel-grey heavy metallic element with very high melting point, used for alloying steel.

Dress : Finish a surface off.

Chisel : Tool having square bevelled end for shaping wood, stone or metal.

Shank : Shaft of a tool, e.g. drill bit, between head / body and handle.

Taper : To gradually narrow or thin at one end.

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HAZARD IDENTIFICATION AND CONTROL (HIAC) FORM

MDG

SHARPEN A DRILL

STEPS IN OPERATION / PROCESS	POTENTIAL ACCIDENT / INCIDENT	CONTROLS (BY RESPONSIBLE PERSON)
1. Use pedestal grinder.	• Eye injuries due to flying particles when grinding.	• Wear appropriate, enclosed safety goggles.
	• Injuries when loose clothing gets cought in rotating wheel.	• No loose clothing. Wear cap or hair net in case of long hair.
	• Disintegration of cracked or damaged wheel can cause serious injury.	• Always inspect wheel before commencing work. • Stand aside and allow wheel to run at full speed for a short while.
2. Use hand tools.	• Using damaged tools or wrong tools for the job can cause injury and damge to equipment.	• Always use the correct tools for the job. • Ensure tools are in good condition. • Use tools correctly. • Wear appropriate PPE where necessary. • Always take good care of tools. Maintain, clean and store it properly.

NOTE: Before doing the practical work contained in this module, the learner must study the content of the above HIAC form again and then sign the statement below.

The above risks, which will be encountered in this module, are fully understood and will be controlled during the practical work.

Signature of learner: _____

Signature of Training Officer: _____

Date: _____

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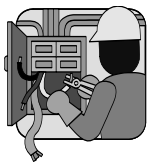

1. SHARPEN A DRILL

ITEM / TASK: Parts of a drill.

DESCRIPTION:

A twist drill is an efficient cutting tool consisting of three parts, namely a **point**, a **shank** and a **body**. See Fig 1 below.

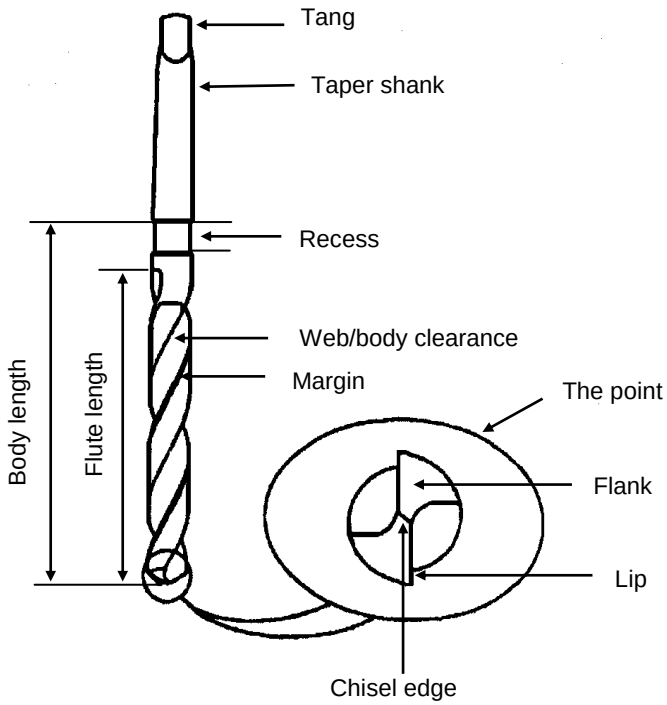

FIG 1.

A. The **point** is the cone shaped end that does the cutting and consists of the following:

- The **chisel edge** which is the exact centre of the axis of the drill. The sharp edge at the extreme tip of the drill should be dead centre.
- The **lips** which are the cutting edges of the drill.
- The **flank**, which is the portion of the point, back from the lips or cutting edge.
- The **lip clearance,** which is the amount the surface of the point, is relieved back from the lips.

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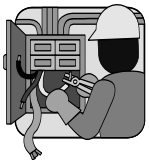

B. The shank.

- Twist drills are made with shanks that are either straight or tapered.
- Straight shank drills are held firmly in adjustable drill chucks.
- Taper shank drills have shanks that are tapered in the “Morse Taper” standard.
- These tapers range from No. 1 to No. 5 and these drills can fit directly into drill spindles with “Morse Tapers”, or can be adapted to fit by using tapered sleeves. (Sockets)
- On the taper shank is a tang. This tang fits into a slot in the spindle sleeve or socket, and assists to disengage the two tapers from each other.

C. The **body** is the portion between the point and the shank (refer to Fig 1) and consists of:

- The **flutes**, which are two or more spiral grooves that run the length of the drill body. The flutes do four things, namely:
  - they help form the cutting edge of the drill points,
  - they curl the chips tightly for easier removal,
  - they form channels through which the chips can escape from the hole being drilled, and
  - they allow the coolant and lubricant to get down to the cutting edge.
- The **land** (margin), which is the narrow strip, extending back the entire length of the flute. It is the full diameter of the drill.
- The **body clearance** which is the part of the drill body that has been reduced in order to cut down friction between the drill and the wall of the hole.
- The **web** which is the metal column that separates the flutes. It gradually increases in thickness towards the shank to give added strength.

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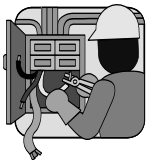

2. SHARPEN A TWIST DRILL

ITEM / TASK: Off-hand drill sharpening.

DESCRIPTION:

A. Sharpening procedure (see Figs 2 and 3 on the next page).

Ask your Training Officer to demonstrate this procedure.

- Visually check the existing angles of the cutting edges and decide whether they are correct, or establish the amount of error by measuring the angles. Refer to Table 1 below.

TABLE 1.

DRILL POINT AND LIP ANGLES.

MATERIAL	INCLUSIVE ANGLE	LIP RELIEF ANGLE
Mild and medium steel	118°	12° - 15°
Hard steel	125° - 135°	10° - 12°
Cast iron	90° - 100°	12°
Brass, bronze and copper *	118°	15°
Aluminium and magnesium alloys *	100°	15° - 18°

* Cutting edge of drill must be ground away slightly.

- Support the drill approximately 40 mm from the tip with one hand and grasp the shank of the drill with the other.
- Position the cutting edge of the drill to the wheel in such a way that it is parallel with the face of the wheel. See Fig 2 on next page.

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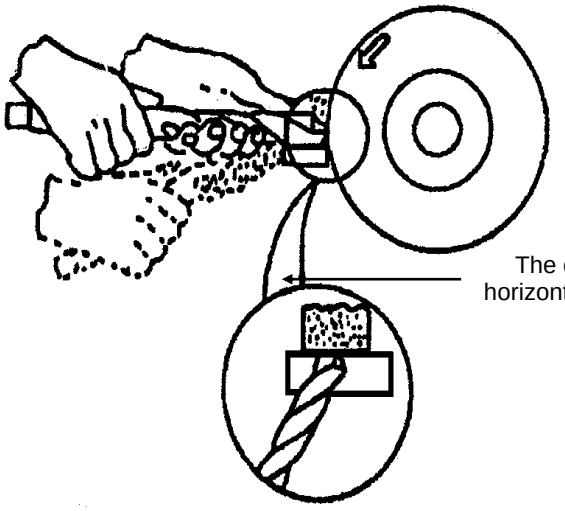

FIG 2.

- Position the fingers nearest the tip of the drill on the tool-rest and lightly touch the cutting edge of the drill onto the wheel. See Fig 3.

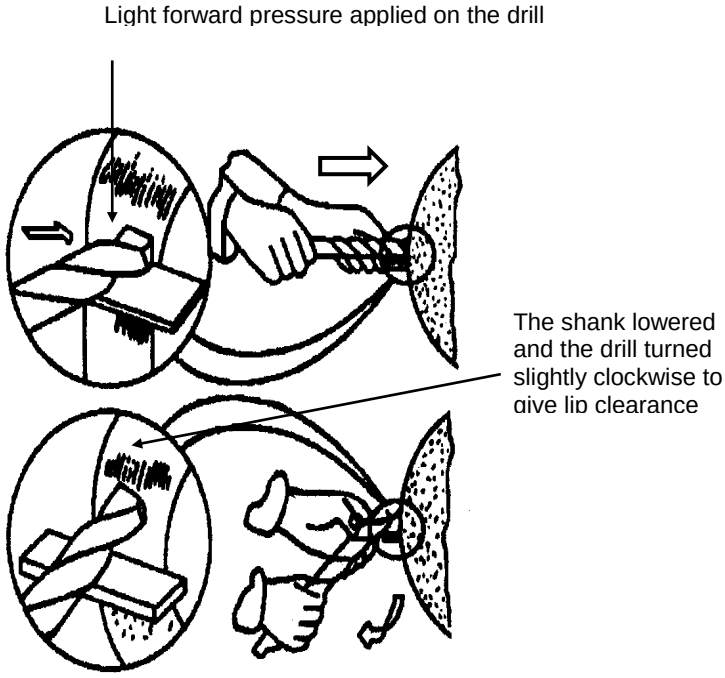

FIG 3.

NB:

Safety goggles must be worn. No loose clothing.

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- Apply light forward pressure on the drill. Using the tool-rest as the point of pivot, lower the hand grasping the shank of the drill at the same time turning the drill clockwise slightly to give lip clearance. Fig 3 on previous page.
- Release the pressure and return the drill cutting edge parallel with the face of the wheel.
- Dip the drill into water frequently to avoid overheating.
- Repeat the above steps approximately four times.
- Keep the hand at the tip of the drill stationary and rotate the drill until the second cutting edge is in position for grinding.
- Repeat the grinding stages until wear is removed.

B. Checking the lip angle using a grinding gauge. (Fig 4)

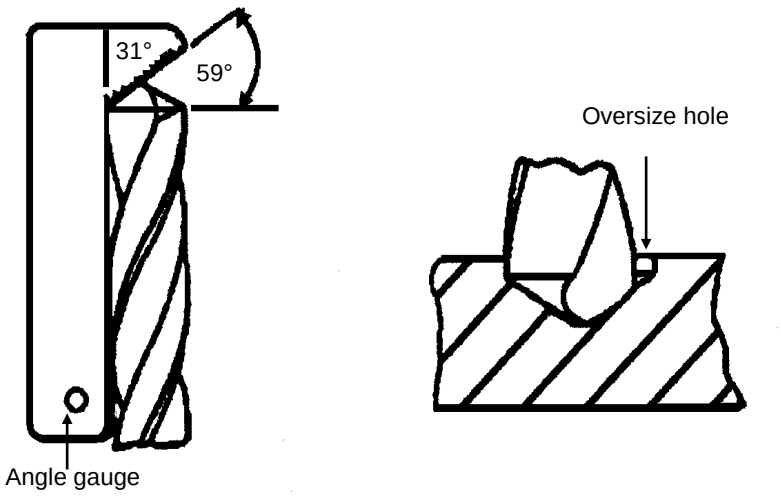

FIG 4.

- Position the drill against the gauge and bring the cutting edge up to coincide with the angle on the gauge.
- Visually check that the lip angle is the same as the gauge. (Included angle of 118°) Refer to Fig 4.
- Turn the drill to position the second cutting edge to the gauge and visually check the angle.
- Correct any error by grinding it on the pedestal grinder.

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NB:

Lips at different angles will cause an oversize hole. (See Fig 4 on previous page)

C. Checking the lip lengths. Only applicable to a taper shank. (Fig 5)

- Smear the gauge with chalk.
- Position the drill on the drill gauge centre pin to support it.
- Touch the lip on the back face of the gauge, and scribe a line. See Fig 5.

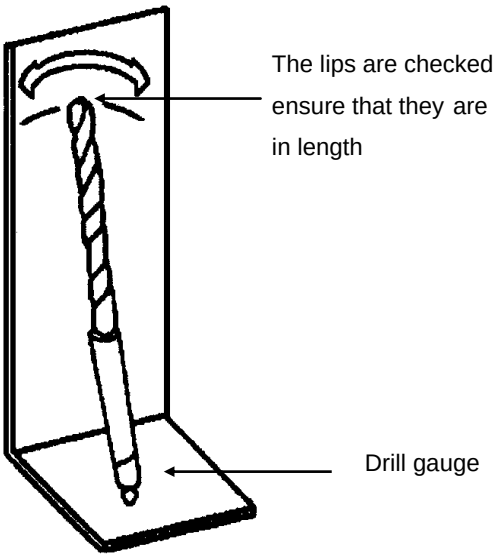

FIG 5.

- Turn the drill through 180° and scribe a line with the second lip. This line should coincide with the first line if both cutting edges are of the same length.
- Correct any error by grinding.

NB:

Lips of different lengths will cause an oversize hole. (See Fig 6 on next page)

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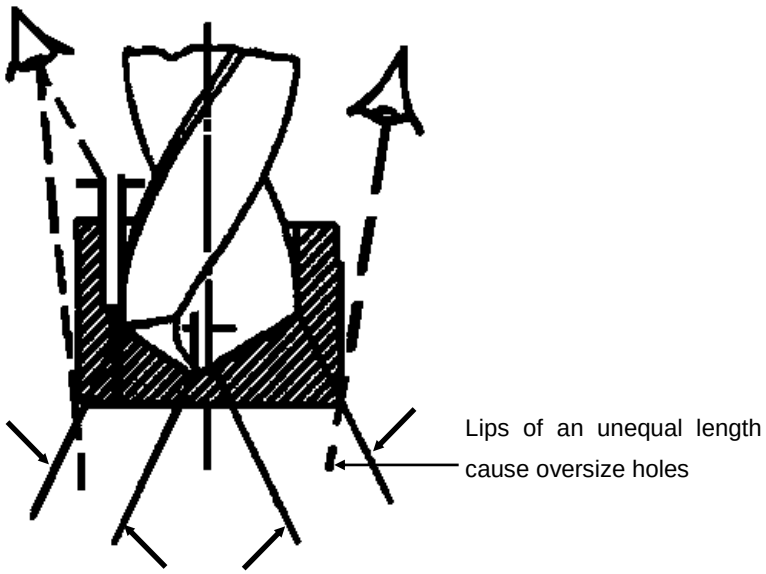

FIG 6.

D. Thinning the point.

See Fig 7 on the next page.

- Grasp the drill with both hands, with one hand near the point of the drill.
- Position the back edge of one side of the web to the corner of the grinding wheel.
- Apply light pressure to the drill and thin the point.

NB:

Ensure that the drill cutting edge does not touch the grinding wheel.

- Repeat the operation on the other side of the web.

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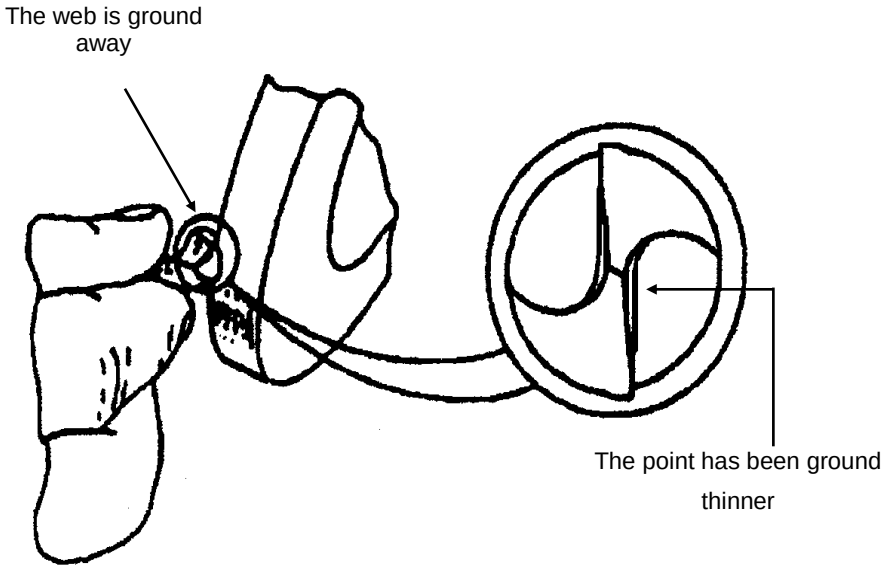

FIG 7.

NB:

The cutting edges of the drill must be relieved (ground away slightly) to prevent it from digging in when drilling brass, bronze, copper, aluminium and magnesium alloys. (Fig 8)

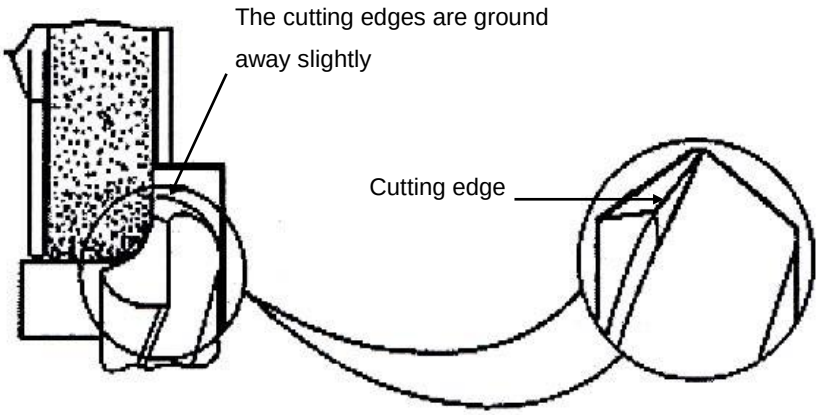

FIG 8.

DO THE PRACTICE ON THE NEXT PAGE.

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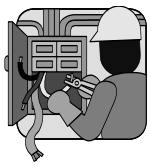

PRACTICE

Practice sharpening a twist drill.

Ask your Training Officer to check your work and if it is correct, to sign below.

LEARNER	TRAINING OFFICER
DATE :	DATE :
SIGNATURE :	SIGNATURE :

REMEMBER ALWAYS WORK SAFE

Once you have passed the practice, you are now at liberty to request a Formative Assessment from your Assessor.