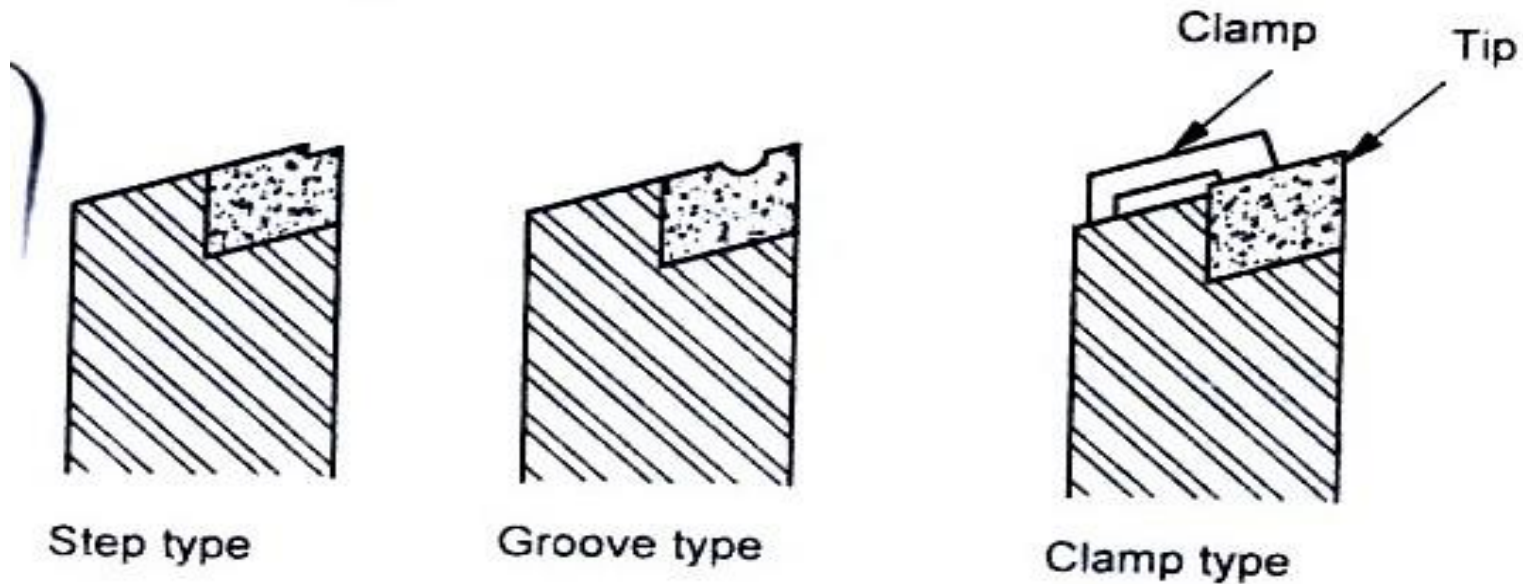


TYPES OF CHIP BREAKERS



In the step type, a step is ground on the tool face behind the cutting edge. This step will break the chip.

In groove type, a groove on the tool face behind the cutting edge will break the chip.

In the clamp type, a thin chip breaker is clamped or screwed on the face of the tool.

CUTTING TOOL MATERIALS

The various materials are used to remove metal from work piece. The **tool must be harder than the material** which is to be cut. The selection of cutting tool material will depend upon the following factors

- ❖ Volume of production
- ❖ Tool design
- ❖ Type of machining process
- ❖ Physical and Chemical properties of work material
- ❖ Rigidity and condition of machine

Properties Of Cutting Tool Material

- ✓ Hot Hardness
- ✓ Wear Resistance
- ✓ Toughness
- ✓ Low Friction
- ✓ Cost Of Tool

Classification Of Tool Materials

1. Carbon Tool Steel
2. High Speed Steel
3. Cemented Carbides
4. Ceramics
5. Diamonds

CARBON TOOL STEEL

- ✓ These are suitable for **low cutting speeds** & used in those applications where the cutting temperature is below 200°C
- ✓ Such steels have **good hardness, strength & toughness.**
- ✓ Cutting tools such as **taps, dies, reamers, hacksaw blades** are made by using these materials.

HIGH SPEED STEEL

- ✓ This tool steel cuts the metal effectively even at **high speed**
- ✓ It has superior **hot hardness** and **high wear resistance**
- ✓ The cutting speeds can be **2 to 3 times** higher than **carbon steel**
- ✓ This tool steel maintains its **hardness** even upto **900°C**
- ✓ The various **alloying elements** to improve hot hardness and wear resistance are **tungsten, chromium, vanadium, cobalt and molybdenum**

✓ H.S.S is widely used for drills, many types of general purpose milling cutters, broaches, taps, turning tools and dies.

The various types of high speed steels are

1. 18-4-1 high speed steel
2. Molybdenum high speed steel
3. Cobalt high speed steel

18-4-1 HIGH SPEED STEEL

- ✓ It contains 18% tungsten, 4% chromium & 1% vanadium.
- ✓ This type of materials give excellent performance over a great range of materials and cutting speeds and retain its hardness upto 600°C
- ✓ The various tools such a drill bits, single point cutting tools, milling cutters etc

MOLYBDENUM HIGH SPEED STEEL

- ✓ This steel has 6% molybdenum, 5% tungsten, 4% chromium and 2% vanadium
- ✓ It has high toughness and cutting ability

COBALT HIGH SPEED STEEL

- ✓ This steel has 12% cobalt, 20% tungsten, 4% chromium & 2% vanadium
- ✓ It is also known as **super high-speed steel**
- ✓ This steel is used for heavy duty and rough cutting tools like planer tool, milling cutter, lathe tools etc..

CEMENTED CARBIDES

- ✓ Cement carbides are made by mixing tungsten powder and carbon at high temperature (1500°C) in the ratio of 94 and 6 respectively by weight
- ✓ This can be used for much higher cutting speed
- ✓ The tool can withstand higher temperature up to 1000°C

The tools materials are classified into two main types

1. Straight tungsten carbides
2. Alloyed tungsten carbides

CERAMICS

- ✓ Aluminium oxide and boron nitride powders are mixed together and sintered at 1700°C to form the ingredients of ceramic tool
- ✓ These materials are very hard with good compressive strength
- ✓ High cutting speed
- ✓ Rigidity of tool and work piece
- ✓ Highly finished surface of cutting tool

DIAMONDS

- ✓ It is the **hardest cutting material**
- ✓ It has low coefficient of friction, high compressive strength and is extremely wear resistant.
- ✓ It is used for **machining hard materials such as glass, plastics, ceramics etc,**
- ✓ The deformation during process is very less
- ✓ It **can resist temperature upto 1250°C**

- ✓ It is the hardest substance
- ✓ It has low coefficient of thermal expansion
- ✓ It has high heat conductivity
- ✓ It has poor electrical conductivity
- ✓ It has very low coefficient of friction