

# **Rolling Steel into Shape**

**Leaving Cert Engineering Notes**

# Ingot



# Billet



Bars, rods and wire are all made from billets in a great variety of sizes

# Bloom

Blooms are rolled into structural sections, such as girders, channels, beams and angles used for building bridges, ships, factory roofs, electricity pylons etc.....



# Slabs

Slabs are rolled to produce:

- Steel plate used to build ships
- Sheet steel for car bodies, cookers, fridges, barns etc....
- Tinplate for food canning and drink cans
- Strip steel in various widths etc....
- Welded tubing for fabrication

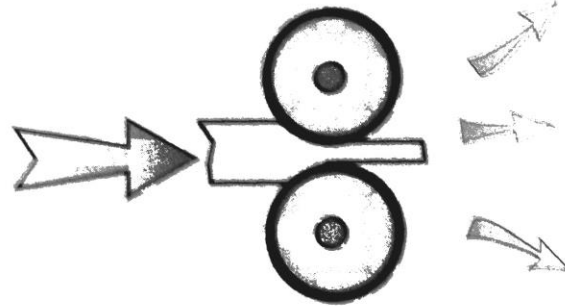


# Primary Rolling

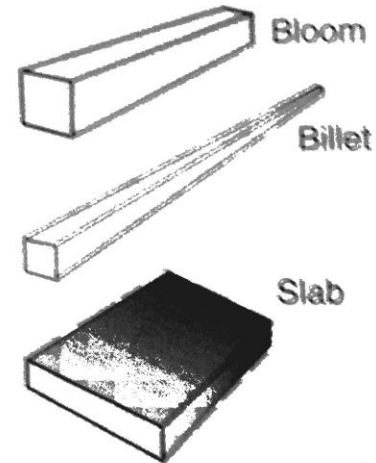
Primary rolling of steel from ingot to blooms, billets and slabs



Ingots from the steel mills which have been soak heated to rolling temperature (1200°C)



Rolling mills



This is a representation of primary rolling of ingots into blooms, which are used to make large sections, billets, for smaller sections, and slabs, from which sheet steel is made

# Steps in Primary Rolling

- First stage in changing the shape of ingots
- Ingots first heated to 1200°C.....Malleable etc.....
- One rolling of a piece of steel through a set of rollers is called a *pass*
- It takes many passes through the rollers to produce a bloom, billet or slab
- Power needed is immense

# Stages in rolling steel

1. Heating on ingots to rolling temperature
2. Primary rolling to blooms, billets or slabs
3. Cooling followed by inspection
4. Re-heating in a re-heating furnace
5. Rolling to required shape

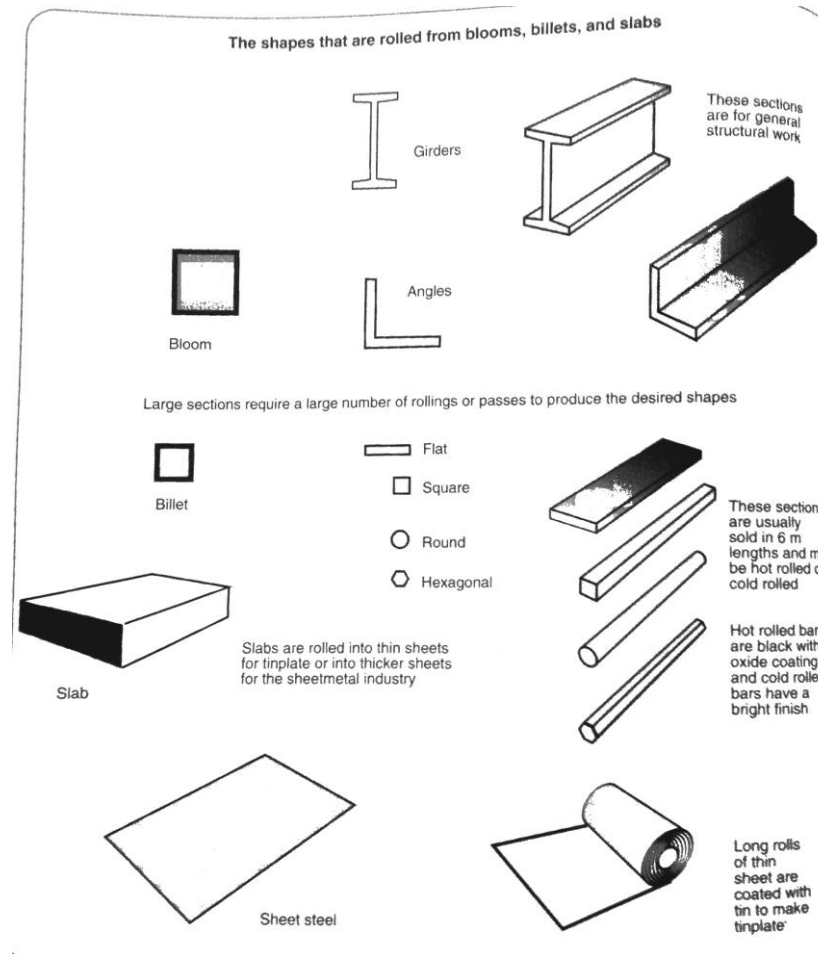


# Sections in Demand

Bars may be.....

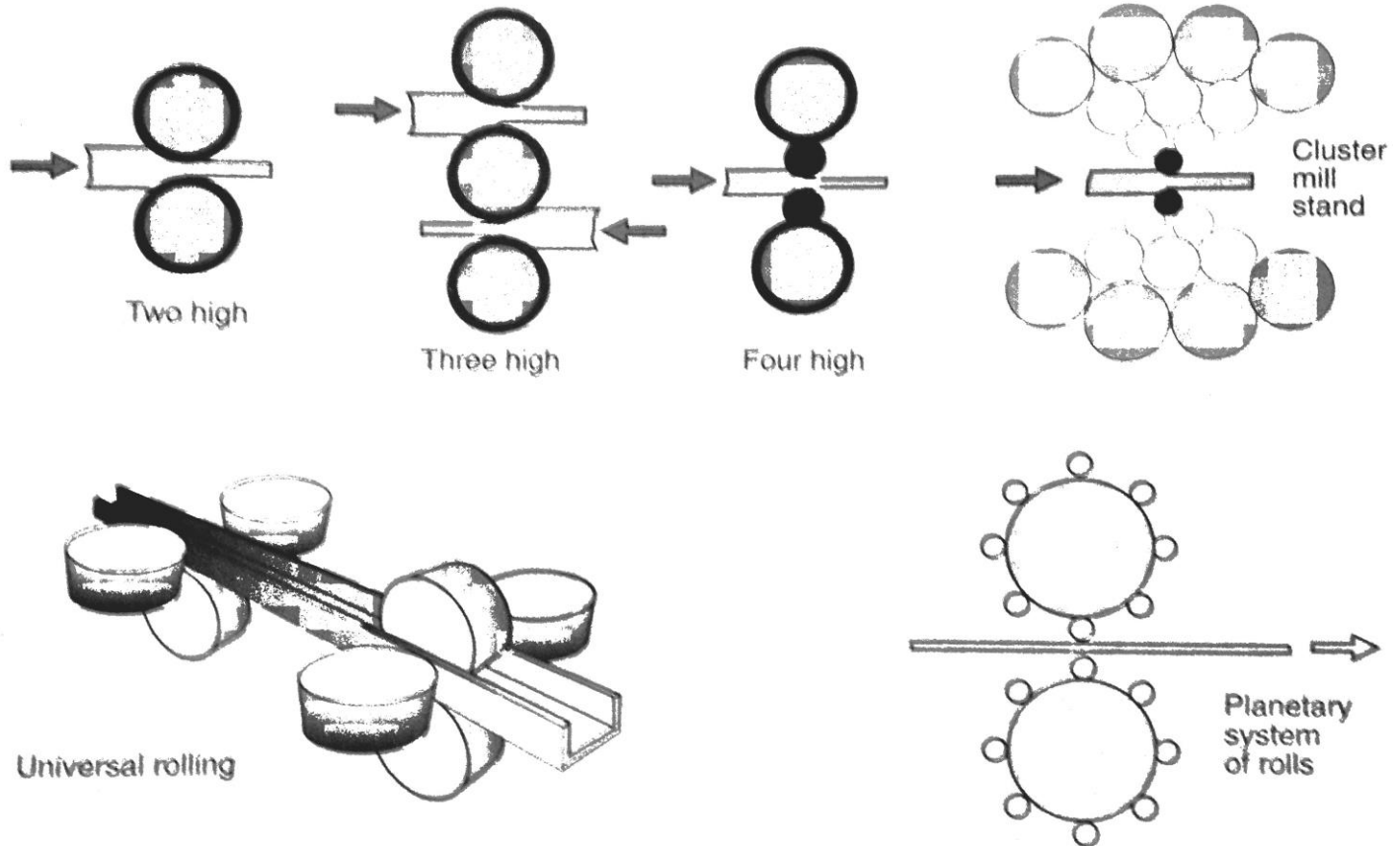
- Round, Square, Hexagonal, Octagonal, Equal/unequal angles, U- shaped or channel, H-Shaped girders etc.....
- Steel is also available as sheets of various thickness, hollow sections and wires

# Shapes that are rolled....

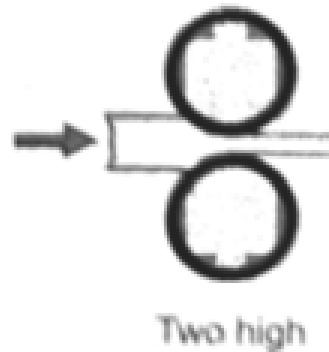


# Rolling Mill Stands

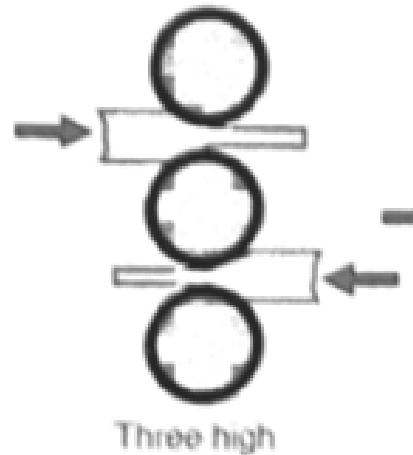
The different rolling mill stands



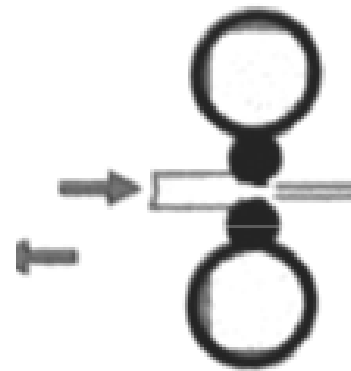
- **Two high mill stand**: Two rolls – one placed above the other. Used for semi-finishing. Material can be reversed... go forward through the rolls and then back through them.



- **Three high mill stand**: Do not reverse. Metal being rolled is lifted or lowered as required as required for the next rolling gap, for the next pass.

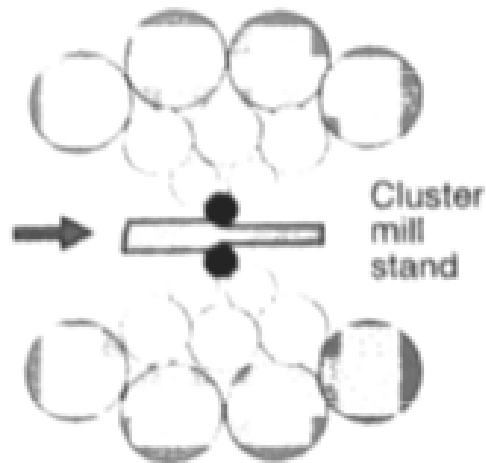


- **Four high mill stand:** Although there is four rolls, only two come in contact with the metal. The larger two are to prevent the working rolls from bending. Four high mills are usually reversing and are mainly used to produce plates and strips

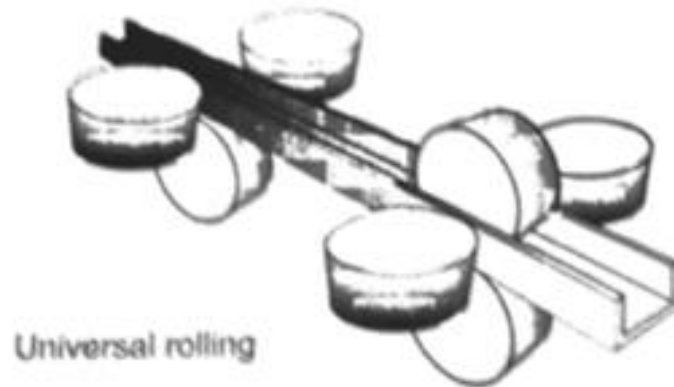


Four high

- **Cluster mill stand**: This provides great rigidity for rolling cold sheet accurately. Most expensive.

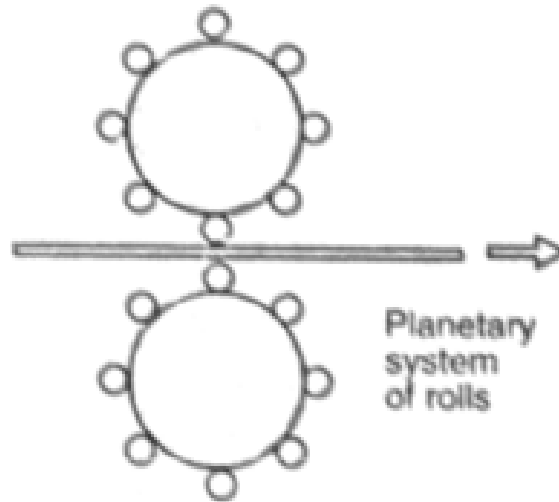


- **Universal mill stand**: Combinations of vertical and horizontal rolls are used to produce sections by rolling all faces in one pass. Used to produce I or H beams.





- **Planetary Mill Stand**: Plate and sheet are produced by this mill and due to a large number of rolls, great rolling force can be exerted.



# Different types of rolls

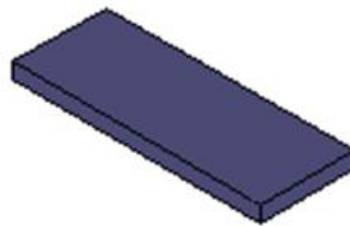
- Plain rolls
  - Profiled rolls
- **Plain rolls** are plain cylinders used to roll flat products such as plate, sheet, strip, as well as being used in primary rolling.
  - **Profiled rolls** are specially shaped rolls... Each pair of rolls is profiled or shaped so that a particular section of metal is rolled.

# Cold Rolling of Steel

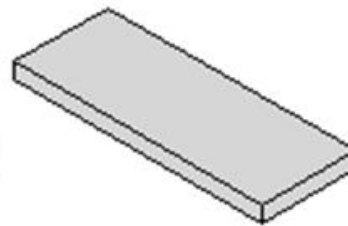
- **Much better accuracy**
- **Finish obtained is smooth**
- As the metal is cold a lot more power is required for rolling. This increases production costs. Friction also occurs between the rolls and the metal, a lubricant is applied, such as palm oil.

# Black mild steel / Bright mild steel

- **Black Mild Steel** has a dark blue oily surface, and **Bright Mild Steel** has a silvery grey surface. Because **Bright Mild Steel** is cold rolled it is accurate in size/shape/form whereas **Black Mild Steel** is not as accurate at all.



Black Mild Steel



Bright Mild Steel