

How Is Steel Manufactured?

Discussion Questions:

- 1) What raw materials are needed to make steel?
- 2) How are the raw materials mixed and treated?
- 3) What by-products and wastes are produced?
- 4) How hot do the furnaces get?
- 5) How is the steel shaped?

Steel is made at a special plant or factory called a *steel mill*. Sometimes it is referred to as the *steel works*. The steel mill contains large ovens called *furnaces* which are used to heat iron until it is white-hot and molten. The molten iron can be cast into shapes or rolled.



Furnaces at the steel mill burn continuously, so employees work in shifts to produce steel in both the day and the night.



What is steel made of?



Raw iron ore is crushed and magnetic rollers extract the iron from the rock dust. This is then heated to make the particles stick together, forming small rocks. This process is called *sintering*.



Coal is heated in a furnace to remove impurities and produce a substance called *coke* which is almost pure carbon.



Flux materials, such as limestone or dolomite, are added to the molten iron. The limestone combines with the impurities in the molten iron, making them easier to remove.



Scrap steel is added to molten iron. The scrap steel includes off-cuts from the steel making process as well as recycled steel that comes from household collections and scrap metal yards.

The processed iron ore and the coke is combined in a blast furnace which melts them into a liquid metal called *pig iron*. Impurities combine with the flux material (limestone). This molten material is called slag and is channelled out of the furnace. The slag is cooled and crushed to form material that can be used in road base and cement.



A blast furnace is used to smelt the iron.



Slag is poured into a pit to cool.

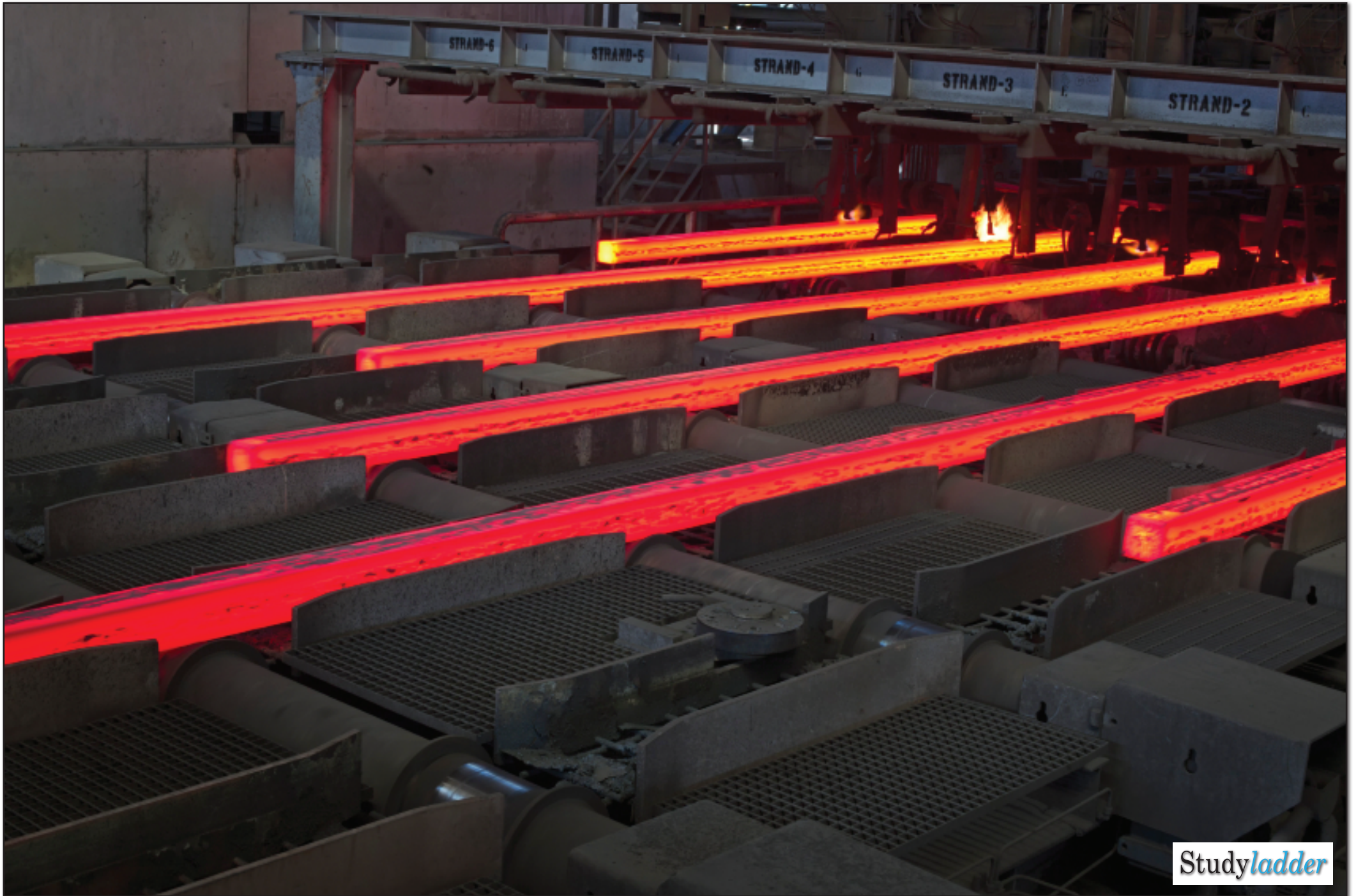


Scrap metal is added to the molten iron in the furnace, as well as other additives, to create different types of steel. For example, nickel and chromium can be added to make stainless steel.

Other additives such as manganese can be added to the steel mixture, depending on the type of steel being made. The temperature of the molten steel reaches about 1800 °C (3272 °F).



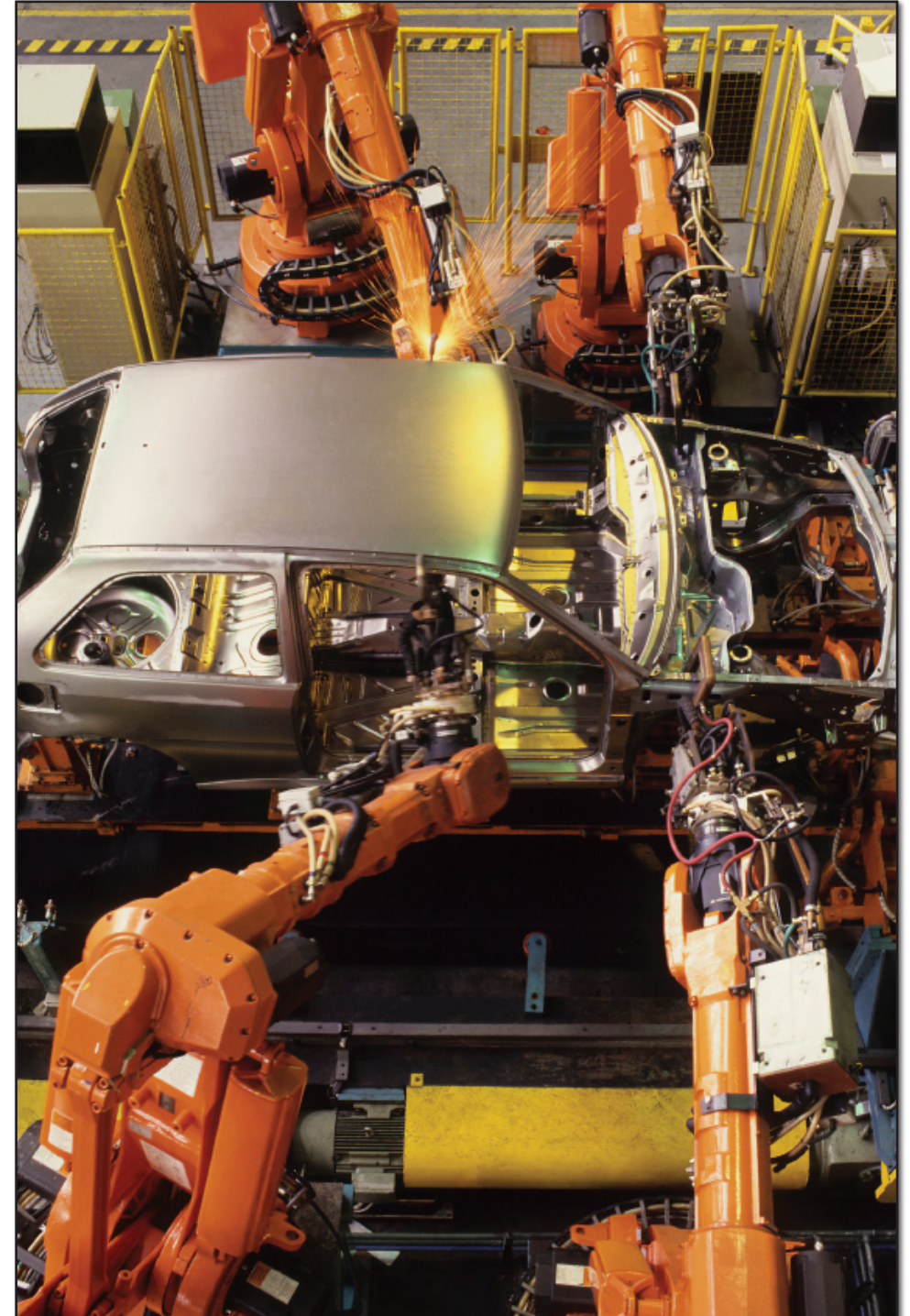
Molten steel can be rolled into long thin strips called billets. The billets are then shaped during the manufacturing process to produce various steel products.



Molten steel can be rolled into slabs. Slabs can be rolled again and again until they are the required thickness.



Steel can be rolled into thin sheets, called sheet metal, which is sold on to many industries. The picture, below right, shows car manufacture. The sheet metal is cut into different shapes to make the car parts.



Molten steel can be poured into molds to create cast-shaped steel products. Steel workers need to wear protective clothing when working with molten steel.





There are many uses for steel, whether it is cast or rolled into shape.