

**AR-29**

# How we make steel

## I. Iron production

The basic recipe for steel begins with making iron from iron ore pellets, crushed limestone and coke, which is coal that has been converted into nearly pure carbon. These raw materials are fed into the blast furnace, where hot blasts of air are blown into the bottom of the furnace and where temperatures reach 4,000° F. As the mixture moves through the furnace, chemical reactions transform it into molten iron. After the blast furnace completes each production cycle, the molten iron is cast into special brick-lined railroad cars and transported to the steelmaking shop.

## II. Steelmaking

Molten iron and scrap are charged into a basic oxygen furnace, or BOF. An oxygen lance is lowered into the vessel, blowing pure oxygen for about 18 minutes at supersonic speeds. The oxygen combines with carbon, manganese and silicon, reducing impurities and converting the molten iron to steel. Steel is further refined at a ladle metallurgy facility, where chemistry can be adjusted and temperatures increased using three electrodes and temperatures increased using three electrodes in a ladle furnace. A vacuum degassing unit is used to produce ultra-low carbon steels by circulating the steel in a vacuum with argon gas.

## III. Making Slabs

Molten steel from the ladle furnace is transferred to a twin-strand continuous slab caster. A crane lifts a ladle of steel and places it on top of the caster. The steel flows from the bottom of the ladle into a reservoir, or tundish, and then into two, water-cooled copper molds. The steel begins to solidify as it passes through a series of rollers and high pressure cooling water sprays. At the bottom of both machines, two continuous nine-inch-thick slabs emerge. Slab widths vary from 35 to 73 inches.

## IV. Rolling and finishing

Steel slabs are transported via railcar to the hot strip mill for heating and rolling to thicknesses up to 5/8 of an inch. Automation is available to provide gauge, profile and shape to meet customer specifications. Depending on a customer's order, steel may be further rolled and treated at various finishing units for cold-rolled or hot-dipped galvanized applications.

