

# The Steel Making Process



PDCA Steel Sheet Pile Committee



# Scrap

- Ferrous scrap metal is gathered and shredded.



# Loading the Charge

- The charge bucket is loaded with 150 tons of shredded scrap which will then be dropped into the furnace.



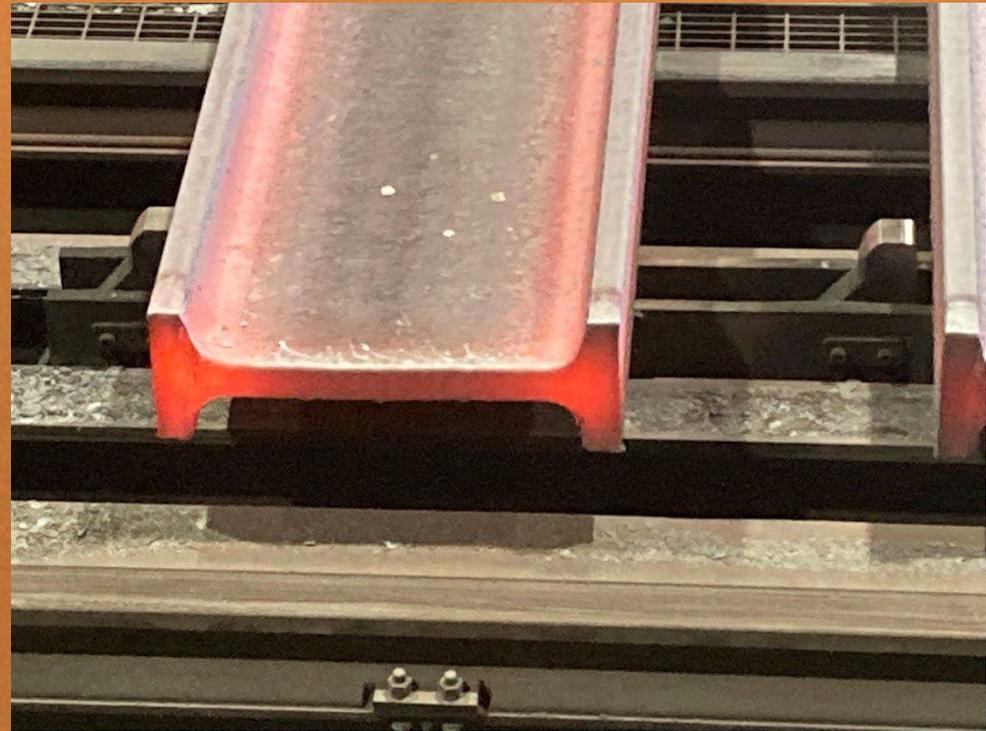
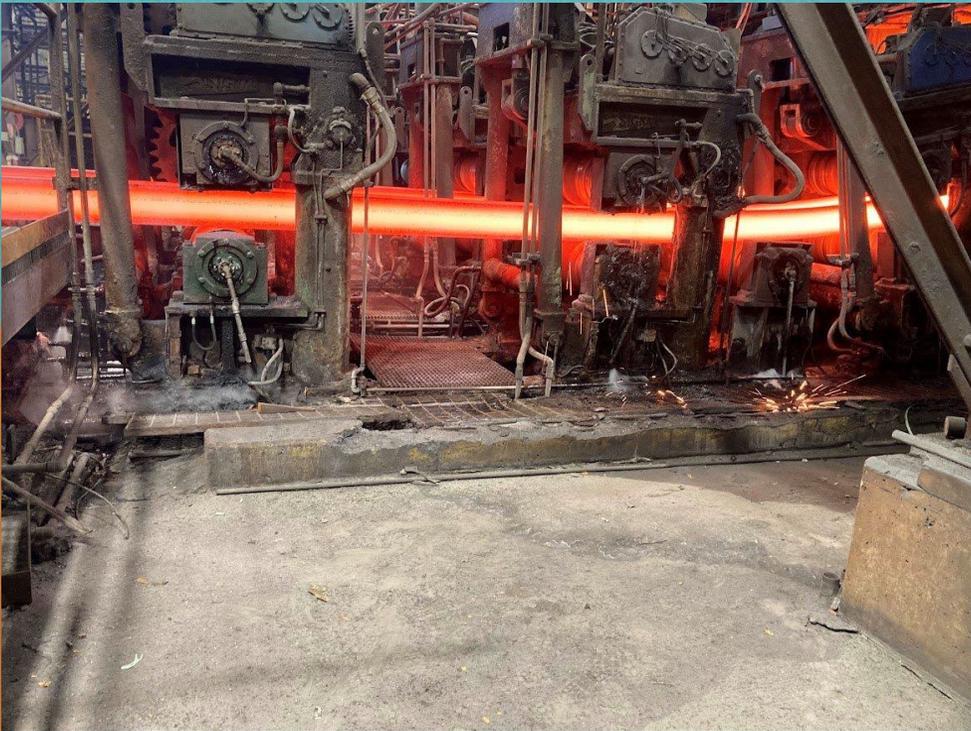
# Electric Arc Furnace

- High powered energy electrodes with oxyfuel creates an electric arc over 3000° F that melts the scrap steel.



# Continuous Caster

- The molten steel is poured into forms that continuously cast into beam blanks known as billets.



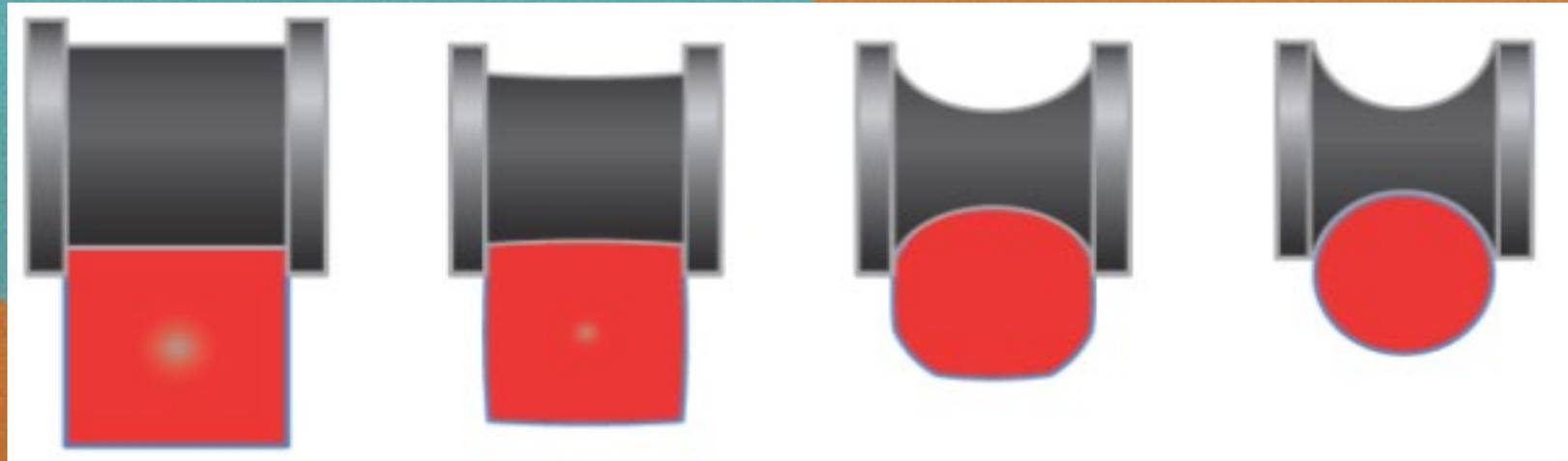
# Reheat Furnace

- Billets are cut at the caster and are charged directly into the reheat furnace or stacked for later use.
- Billets are reheated up to 2200° F using natural gas burners and recuperated air.



# Hot Rolling

- Shaping of steel as a final commercial product, either flat or long, is accomplished by rolling or forging the corresponding semi-finished cast products (billets). This is accomplished by the compressive deformation process in which the thickness is reduced by squeezing it through two rotating cylindrical rolls.



# Rolling Mill – Rougher

- The rougher is composed of one vertical stand and one horizontal stand to break down the billet into the rough shape needed for final forming at the next set of roll stands called the tandem mill.
- The roughing stands can shift in order to work the bar with different shaped passes and hydraulically close the gaps with each pass.



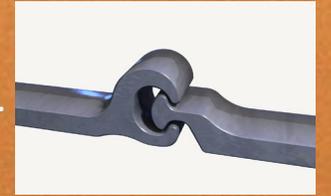
# Rolling Mill – Tandem

- The tandem mill group is composed of three stands: two universal mill stands with an edger between.
- The universal stands work the bars with four rolls from all sides.
- The edger stand is a horizontal stand used to control the bars shape and height.



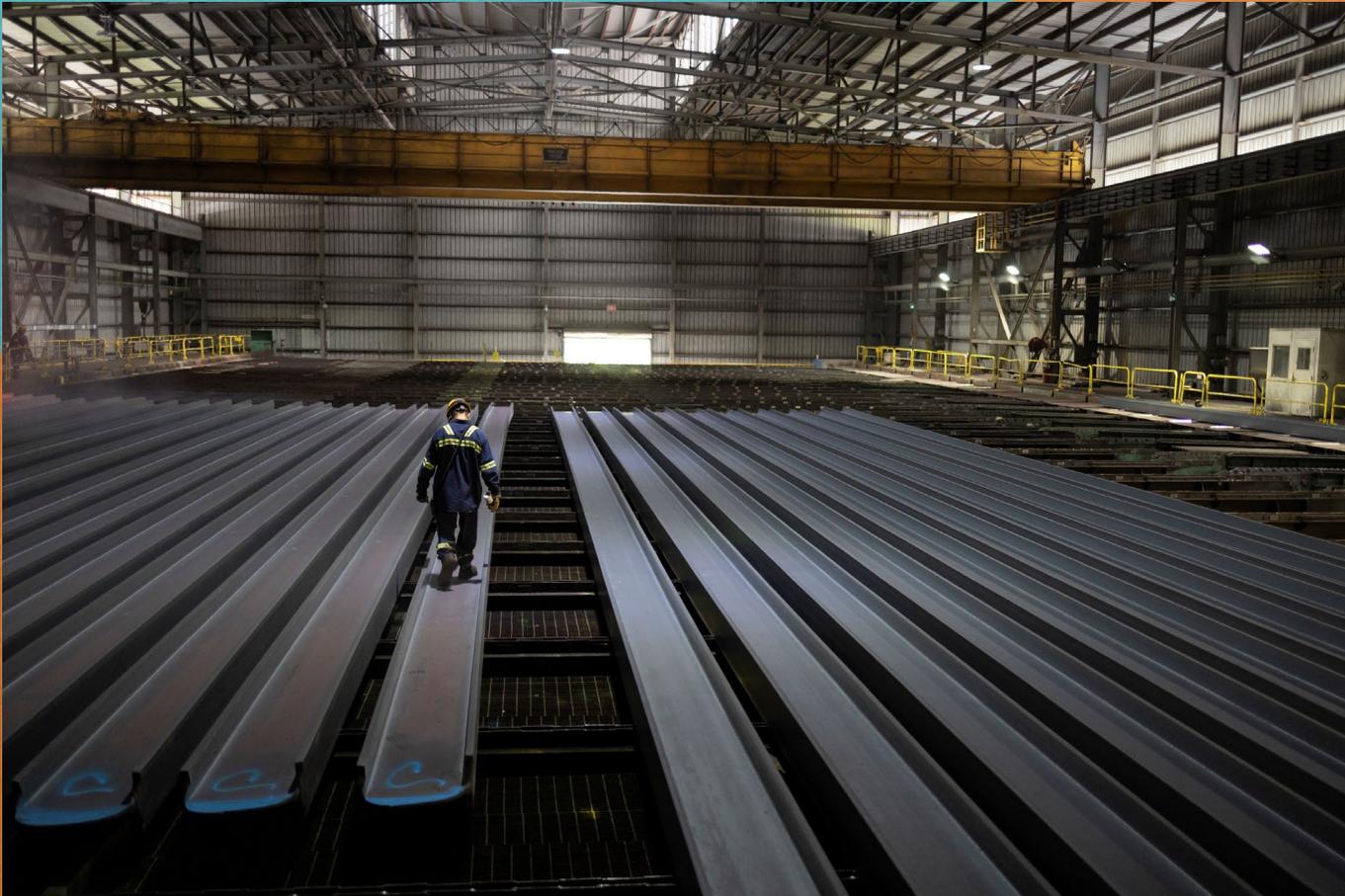
# Rolling Mill – Finishing

- The finishing mill is composed of three in-line horizontal stands for further finishing of the bars.
- At Gerdau, these stands are only used when rolling PZC Sheet Pile in order to shape the ball and socket interlocks.



# Cooling Bed

- Here the steel will recrystallize and form a grain structure, which provides a basis for further processing to establish the final product's mechanical properties



# Straightener

- Nine horizontal rolls straighten out the cold bars utilizing force triangles to exert up to 200 tons of force at each roll.
- Vertical bending rolls at the entry and exit of the straightener guide the bars into the horizontal rolls and straighten the bar in the other direction.



# Cold Saws

- After the straightener two six-foot circular saw cut bars to length.



# Piler & Surge

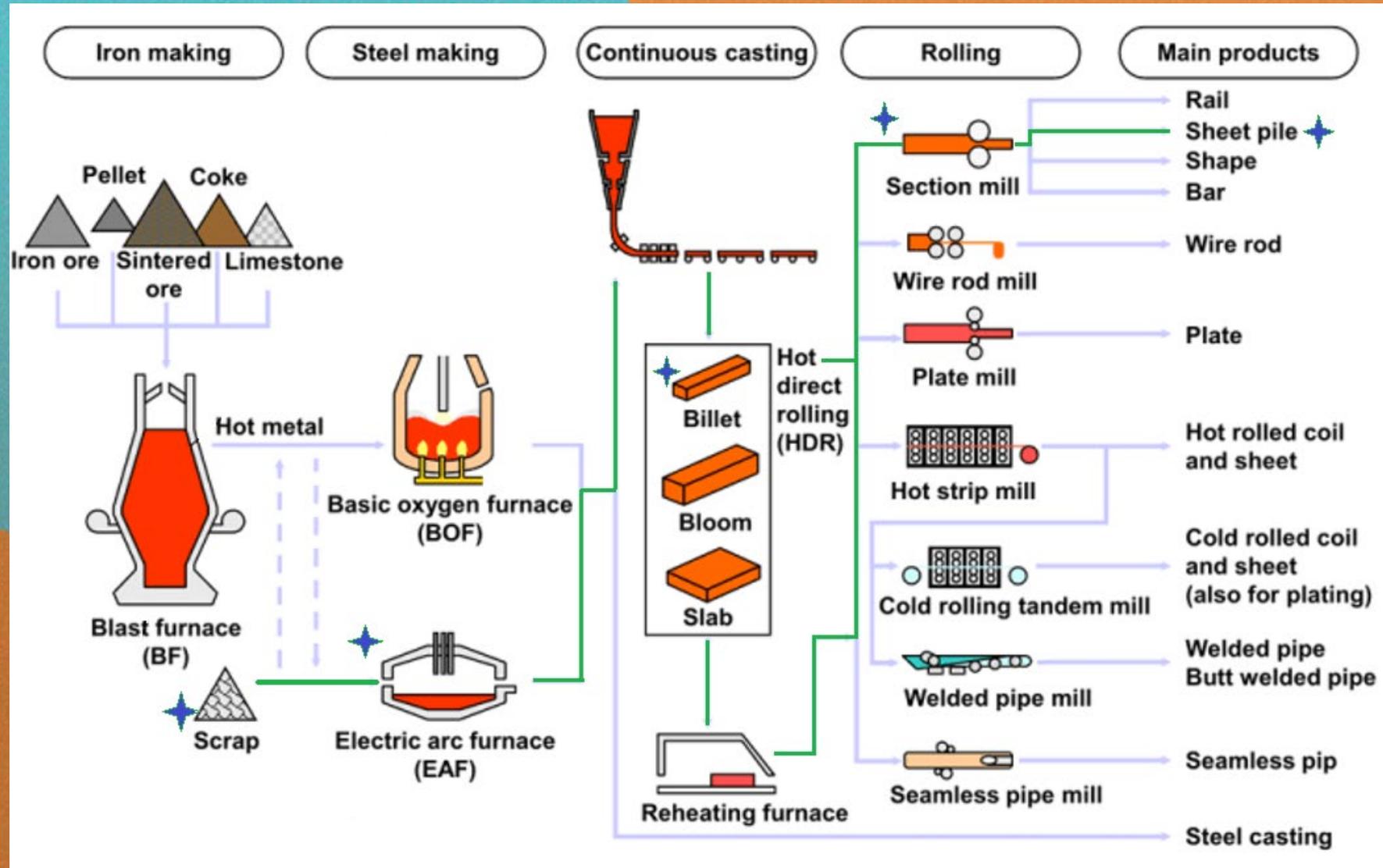
- At the piler, the final product can be stacked and separated for shipment and bundling.
- On the surge, bundles are tagged for identification purposes, visually inspected, and staged for forklifts to move finished product into the yard.



# Shipping



There are several processes in steel making depending on the finished product, but we will focus on structural shape products which steel sheet pile is a part of. At Gerdau, and several other steel mills, these shapes are produced using scrap steel melted using an Electric Arc Furnace. The melted steel is continuously cast into a billet shape which is then either hot rolled directly or reheated and hot rolled into its final shape.



References:

All pictures and manufacturing information provided by Gerdau and JD Fields & Company, Inc.

