GLOSSARY OF TERMS: STEEL INDUSTRY[1]

Agglomerating Processes	Fine particles of limestone (flux) and iron ore are difficult to handle and transport because of dusting and decomposition, so the powdery material usually is processed into larger pieces. The raw material´s properties determine the technique that mills use. ▪ Sinter: baked particles that stick together in roughly one-inch chunks. Normally used for iron ore dust collected blast furnaces. ▪ Pellets: Iron ore or limestone particles are rolled into little balls in a balling drum and hardened by heat. ▪ Briquettes: Small lumps formed by pressing material together. Hot Iron Briquetting (HBI) is a concentrated iron ore substitute for Direct Reduced Iron and scrap for use in electric furnaces.
AISI	American iron and Steel Institute; an Association of North American companies that mine iron ore and produce steel products. There are 43 member companies and 230 associate members, which include customers who distribute, process or consume steel. The Institute currently is reorganizing itself as a North American steel trade association, representing the interests of Canada, Mexico and the United States.
Alloy Steel	An iron-based mixture is considered to be an alloy steel when manganese is greater than 1.65%, silicon over 0.5%, copper above 0.6%, or other minimum quantity of alloying elements such as chromium, nickel, manganese, molybdenum or tungsten. An enormous variety of distinct properties can be created for the steel by substituting these elements in the recipe.
Annealing	• **What.** A heat or thermal treatment process by which a previously cold-rolled steel coil is made more suitable for forming and bending. The steel sheet is heated to a designated temperature for a sufficient amount of time and then cooled. • **Why.** The bonds between the grains of the metal are stretched when a coil is cold rolled, leaving the steel brittle and breakable. Annealing “recrystallizes” the grain structure of steel by allowing for new bonds to be formed at a high temperature. • **How.** There are two ways to anneal cold-rolled steel coils: batch and continuous. **(1) Batch (Box).** Three to four coils are stacked on top of each other, and a cover is placed on top. For up to three days, the steel is heated in an oxygen-removed atmosphere (so that it will not rust) and slowly cooled. **(2) Continuous.** Normally as part of a coating line, the steel is uncoiled and run through a series of vertical loops within a heater: The temperature and cooling rates are controlled to obtain the desired mechanical properties for the steel.

[1] Source: “Everything You Always Wanted to Know About Steel...But Were Afraid to Ask, A Glossary of Terms and Concepts”; Salomon Brothers, September 26, 1995, by Michelle Galanter Applebaum.

Attrition	• **What**. A natural reduction in work force as a result of resignations, retirements or death. • **Why.** Most unionized companies cannot unilaterally reduce their employment levels to cut costs, so management must rely on attrition to provide openings that they, in turn, do not fill. Because the median ages of work forces at the integrated mills may be more than 50, an increasing number of retirements may provide these companies with added flexibility to improve their competitiveness.
Auto Stamping Plant	A facility that presses a steel blank into the desired form of a car door or hood with, for example, a powerful die (pattern). The steel used must be ductile (malleable) enough to bend into shape without breaking.
Automatic Gauge Control	Using hydraulic roll force systems, steelmakers have the ability to precisely control their steel sheet's gauge (thickness) while it is traveling at more feed-forward systems, a computer's gap sensor adjusts the distance between the reduction rolls of the mill 50-60 times per second. These adjustments prevent the processing of any off-gauge steel sheet.
Bake Hardenable Steel	A cold-rolled, low-carbon sheet steel used for automotive body panel applications-Because of the steel's special processing, it has good stamping and strength characteristics and, after paint is baked on, improved dent resistance.
Basic Oxygen Furnace (BOF)	• **What.** A pear-shaped furnace, lined with refractory bricks, that refines molten iron from a blast furnace and scrap into steel-Up to 30% of the charge into the BOF can be scrap, with hot metal accounting for the rest. • **Why.** BOFs, which can refine a heat (batch) of steel in less than 45 minutes, replaced the traditional open-hearth furnaces in the 1950s, which required five to sic hours to process the metal. The BOFs rapid operation, lower cost and ease of control give it a distinct advantage over previous methods. • **How.** Scrap is dumped into the furnace vessel, followed by the hot metal from the blast furnace. A lance is lowered from above, through which a high-pressure stream of oxygen is blown in order to cause chemical reactions that separate impurities as fumes or slag. Once refined, the liquid steel and slag are poured into separate containers.

Bars	Long, thin steel products that are rolled from billets, Merchant bar and reinforcing bar (rebar) are two common categories of bars, where merchants include rounds, strips, flats, angles, squares and channels that are used by fabricators to manufacture a wide variety of products such as furniture, stair railings and farm equipment. Rebar is used to strengthen concrete in highways, bridges and buildings (see Sheet Steel)
Billet	Semi-finished steel form that is used for "long" products; bars, channels or other structural shapes. A billet is different from a slab because of its outer dimensions; billets are normally two to seven inches square, while slabs are 30-80 inches wide and two to ten inches thick. In general, both shapes are continually cast, but may differ greatly in their chemistry.
Black Plate	Cold-reduced sheet steel which is 12-32 inches wide and serves as the substrate (raw material) to be coated in a tin mill.
Blast Furnace	• **What.** A towering cylinder lined with heat-resistant (refractory) bricks used by integrated steel mills to smelt iron from its ore. Its name comes from the "blast" of hot air and gases forced up through the iron ore, coke and limestone that load the furnace. • **How.** Under extreme heat, chemical reactions among the ingredients release the liquid iron from the ore. The blast of air burns the coke, and limestone reacts with the impurities in the ore to form a molten slag. The hot metal collects in the bottom of the furnace. Once fired up, a blast furnace will operate continuously until it needs to be relined seven to ten years later.
Blanking	• **What.** First step in preparing flat-rolled steel for use by an end user. A blank is a section of sheet that has the same outer dimensions as the specified part (such as a car door or hood) but has not yet been stamped. • **Why.** Steel processors may offer blanking for their customers to reduce labor and transportation costs; excess steel can be trimmed prior to shipment.
Bloom	Semi-finished steel form with a rectangular cross-section that is more than eight inches wide. This large cast steel shape is broken down in the mill to produce the familiar I-beams, H-beams and sheet piling.
Burr	Very subtle ridge on the edge of strip steel left by cutting operations such as slitting trimming, shearing or blanking. For example, as a steel processor trims the sides of the sheet steel parallel or cuts a sheet of steel into strips, its edges will bend with the direction of the cut (see Edge Rolling).
Butt-Weld Pipe	The standard pipe used in plumbing. Heated skelp is passed continuously through welding rolls, which form the tube and squeeze the hot edges together to make a solid weld.

Capacity	Normal ability to produce steel in a given time period. This rating should include maintenance requirements, but because such service is scheduled to match the machinery's needs (not a calendar's), a mill might run at more than 100% of capacity one month and then fall well below rated capacity as maintenance is performed. • **Engineered Capacity.** The theoretical volume of a mill, given its constraints of raw material supply and normal working speed. • **"True" Capacity**. Volume at full utilization, allowing for the maintenance of equipment and reflecting current material constraints (Bottlenecks of supply and distribution can change overtime –capacity will expand or reduce).
Cast Iron	(See Pig Iron)
Charge	Act of loading material into a vessel. For example, iron ore, coke and limestone are charged into a Blast Furnace; a Basic Oxygen Furnace is charged with scrap and hot metal.
Coils	Steel sheet that has been wound. A slab, once rolled in a hot-strip mill, is more than one-quarter mile long; coils are the most efficient way to store and transport sheet steel.
Coke	• **What.** The basic fuel consumed in blast furnaces in the smelting of iron. Coke is a processed form of coal. Approximately 1,000 pounds of coke are needed to process a ton of pig iron and represent more than 50% of an integrated steel mill's total energy use. • **Why.** Metallurgical cola burns sporadically and reduces into a sticky mass. Processed coke, however, burns steadily inside and out and is not crushed by the weight of the iron ore in the blast furnace. • **How.** Inside the narrow confines of a coke oven, coal is heated without oxygen for 18 hours in order to drive off gases and impurities.
Coke Oven Battery	Set of ovens that process coal into coke. Constructed in batteries of ten – 100 ovens that are 20 feet tall, 40 feet long and less that two feet wide. Coke batteries, because of the exhaust fumes emitted when coke is pushed from the ovens, often are the dirtiest area of a steel mill complex.

Cold Reduction	• **What.** Special mills roll cold coils of pickled hot-rolled sheet to make the steel thinner, smoother and stronger than can be created in a hot mill. • **How.** Stands of rolls in a cold-reduction mill are set very close together and press a sheet of steel from one-quarter inch thick into less than an eighth of an inch, while more than doubling its length.
Cold-Rolled Strip (Sheet)	Sheet steel that has been pickled and run through a cold-reduction mill. Strip has a final product width of approximately 12 inches, while sheet may be more than 80 inches wide. Cold-rolled steel is considerably thinner and stronger than hot-rolled sheet, so it will sell for a premium (see Sheet Steel).
Consumption	Measures the physical use of steel by end users. Steel consumption estimates, unlike steel demand figures, account for changes in inventories in their calculation. • **Apparent Consumption.** Derived demand for steel using AISI reported steel mill shipments plus Census Bureau reported imports, less Census Bureau reported exports. Domestic market share percentages are based on this figure which does not take into account any changes in inventory.
Continuous Casting	• **What.** Method of casting steel into a billet, bloom or slab directly from its molten form. • **Why.** Continuous casting avoids the need for large, expensive mills for rolling ingots into slabs. Continuous cast slabs also solidify in a few minutes versus several hours for an ingot. Because of this, the chemical composition and mechanical properties are more uniform. • **How.** Steel from the BOF or electric furnace is poured into a tundish (a shallow vessel that looks like a bathtub) atop the continuous caster. As steel carefully flows from the tundish down into the water-cooled copper mold of caster, it solidifies into a ribbon of red-hot steel. At the bottom of the caster, torches cut the continuously flowing steel to form slabs or blooms.
Contract Sales	Steel products committed to customers through price agreements extending three to 12 months. Abut one half of all flat-rolled steel is sold on this basis, primarily because the auto companies sign agreements to cover an entire model year's production. Price increases that the steel mills might announce during the year do not generally affect the revenues from the contract side of the business.
Conversion Cost	Resources spent to process material in a single stage from one type to another. The costs of converting iron ore to hot metal or pickling hot-rolled coil can be isolated for analysis.

Converter /Processor	Demand from steel customers such as rerollers and tube makers, which process steel into a more finished state such as pipes, tubing and cold-rolled strip before selling it to end users. Such steel generally is not sold on contract, making the converter segment of the mills' revenues more price sensitive than their supply contracts to the auto manufacturers.
Culvert Pipe	Heavy gauge galvanized substrate (raw material) that is spiral-formed or riveted into corrugated pipe which is used for highway drainage applications.
Cut-to-Length	Process to uncoil sections of flat-rolled steel and cut them into the desired length-Product that is cut to length is normally shipped flat-stacked.
Defined Benefit Retirement Plan	A type of pension plan whereby the employer promises to make pension payments to retired employees in specified amounts, regardless of the performance of the fund established to provide for the retirees or the amount contributed. Because the employees' total years of service and their length of retirement are uncertain, the employer's future liabilities must be estimated and can fluctuate over time.
Defined Contribution Retirement Plan	A pension plan in which the employer promises to make specified contributions to the pension fund, but the amount of pension benefits ultimately paid to retired employees depends on how well the pension fund's assets are managed. There are no balance sheet items for Defined Contribution Plans because all liabilities are satisfied in full each year.
Desulfurization	• **What.** Operation that injects a chemical mixture into a ladle full of hot metal to remove sulfur prior to its charging in a Basic Oxygen Furnace. • **Why.** Sulfur enters the steel from the coke in the blast furnace smelting operation, and there is little the steelmaker can do to reduce its presence. Because excess sulfur in the steel impedes its welding and forming characteristics, the mill must add this step to the steel-making process.

Direct Reduced iron (DRI)	• **What.** Processed iron ore that is iron-rich enough to be used as a scrap substitute in electric furnace steelmaking. • **Why.** As mini-mills expand their product abilities to sheet steel, they require much higher grades of scrap to approach integrated mill quality . Enabling the mini-mills to use iron ore without the blast furnace, DRI can serve as a low residual raw material and alleviate the mini-mills´ dependence on scrap. • **How.** The impurities in the crushed iron ore are driven off through the use of massive amounts of natural gas. While the result is 97% pure iron (compared with blast furnace hot metal which, because it is saturated with carbon, is only 93% iron), DRI is only economically feasible in regions where the price of natural gas is below current world prices.
Edge Rolling (Edge Conditioning)	Rolling a strip of steel to smooth the edges. By removing the burr off the coil, it is safer for customers to manipulate.
Electric Arc Furnace (EAF)	Steel-making furnace where scrap generally is 100% of the charge. Heat is supplied from electr5icity that arcs from the graphite electrodes to the meal bath. Furnaces may be either an alternating current (AC) or direct current (DC). DC units consume less energy and fewer electrodes, but they are more expensive.
Electrical Steel	(See Silicon Electrical Steel).
FAS 106	An accounting rule established in 1990 that required companies to change then accounting for the cost of their retirees' future nonpension benefits (life insurance and health services). What were once "pay as you go" or a "cash basis" expense items were changed to account for on an accrual basis. Such costs are now recognized during the employees working years. When the steel companies shifted to the new accounting rule, most charged the "catch-up" to equity in large one-time writedowns as they established the new liabilities on their balance sheets.
FAS 109	Accounting rule for deferred taxes that requires companies to explain within their financial statements the difference between the tax expense found on the income statement and the check actually sent to the Internal Revenue Service (IRS).(This rule superseded FAS 96 and APB 11.). Many steel companies now carry net operating losses (NOLs) on their balance sheets as assets that can be used to offset future taxes. However, under the rules of FAS 109, a valuation allowance may be recorded to reduce these NOLs unless there is a high probability that they will be used.

Fastmet	Process to directly reduce iron ore to metallic iron pellets that can be fed, into an electric ac furnace with an equal amount of scrap. This process is designed to bypass the coke oven-blast furnace route to produce hot metal from iron ore. It also is one of several methods that mini-mills might use to reduce their dependence on high-quality scrap inputs (see Direct Reduced Iron and Hot Briquetted Iron).
Feedstock	Any raw material.
Ferrous Alloy	(See Alloy)
Finishing Facilities	The portion of the steel-making complex that processes semi-finished steel (slabs or billets) into forms that can be used by others. Opposite of the Hot End. Finishing operations can include rolling mills, pickle lines, tandem mills, annealing facilities and temper mills.
Flux	Iron cleaning agent. Limestone and lime react with impurities within the metallic pool to form a slag that floats to the top of the relatively heavier (and now more pure) liquid iron.
FOB Pricing	Freight on Board Pricing. Phrase that explains whether the transportation costs of the steel are included. “FOB Mill” is the price of steel at the mill, not including shipping. • **Freight Equalization**. A common industry practice when a mill sells steel outside its geographic area; it will assume any extra shipping costs (relative to the competition) to quote the customer an equivalent price to get the business.
Galvanized Steel	Steel coated with a thin layer of zinc to provide corrosion resistance in underbody auto parts, garbage cans, storage tanks, or fencing wire. Sheet steel normally must be cold rolled prior to the galvanizing stage. • **Hot Dipped.** Steel is run through a molten zinc coating bath, followed by an air stream “wipe” that controls the thickness of the zinc finish. • **Electrogalvanized.** Plating process whereby the molecules on the positively charged zinc anode attach to the negatively charged sheet steel. The thickness of the zinc coating is readily controlled. By increasing the electric charge or slowing the speed of the steel through the plating area, the coating will thicken. • **Differences.** Electrogalvanizing equipment is more expensive to build and to operate than hot dipped, but it gives the steelmaker more precise control over the weight of the zinc coating. The automotive manufacturers, because they need the superior welding, forming and painting ability of electrogalvanized steel, purchase 90% of all tonnage produced.

Galvalume™	Steel sheet with a unique coating of 55% aluminum and 45% zinc that resists corrosion. The coating is applied in a continuous hot-dipped process, which improves the steel's weather resistance. Galvalume™ is a trademark of BHP Steel, and the product is popular in the metal building market.
Gauge	The thickness of sheet steel. Better-quality steel ha a consistent gauge to prevent weak spots or deformation.
Greenfield Site	Mill that is built "from scratch", presumably on a green field. Many companies merely retrofit old mills (brownfield sites) with new technologies or purchase existing facilities when they wish to expand, so greenfield mills are relatively rare.
Heat	Batch of refined steel. A basic oxygen or electric furnace full of steel. One heat of steel will be used to cast several slabs, blooms or billets.
High-Carbon Steel	Steel with more than 0.3% carbon. The more carbon that is dissolved in the iron, the less formable and the tougher the steel becomes. High-carbon steel's hardness makes it suitable for plow blades, shovels, cutting edges or other high-wear applications.
Hot Band	Coil of steel rolled on a hot-strip mill. It can be sold in this form to customers or further processed into other finished products.
Hot-Briquetted Iron (HBI)	Direct-reduced iron that has been processed into briquettes. Instead of using a blast furnace, the oxygen is removed from the ore using natural gas and results in a substance that is 90%-92% iron. Because DRI may spontaneously combust during transportation, HBI is preferred when the metallic material must he stored or moved.
Hot End	Section of a steel-making complex from the furnace up to, but not including, the hot-strip mill.
Hot Metal	Name for the molten iron produced in a blast furnace. It proceeds to the basic oxygen furnace in molten form or is cast as pig iron.

Hot-Strip Mill	• **What.** A highly capital-intensive reduction line that uses several stands of rolls to turn an eight. To ten-inch thick slab of steel into a coil of one-quarter inch steel. • **Why.** Although continuous casting largely has replaced the ingot breakdown mill, technology has not perfected a way to cast sheet steel directly. When solidifying, the steel's liquid core tends to break out when cast too thin; therefore, the current production process is to cast a thicker slab and roll it into a coil on the hot-strip mill. • **How.** On an half-mile long table, 20-foot long slabs are progressively squeezed longer and thinner by horizontal rolls, while vertical rolls govern the width. Each smaller-spaced roll must rotate faster than the one before; by the end of the line, the sheet steel is traveling at approximately 30 miles an hour as it enters the coiler.
Ingot	An ingot is a form of semi-finished steel. Liquid steel is teemed (poured) into molds, where it slowly solidifies. Once the steel is solid, the mold is stripped, and the 25 to 30 ton ingots are then ready for subsequent rolling or forging.
Integrated Mills	These facilities make steel by processing iron ore and other raw materials in blast furnaces. Technically, only the hot end differentiates integrated mills from mini-mills. However, the differing technological approaches to molten steel imply different scale efficiencies and, therefore, separate management styles, labor relations and product markets, Nearly all integrated mills specialize in flat-rolled steel.
Iron Carbide	One of several substitutes for high-quality, low-residual scrap for use in electric furnace steelmaking. Iron carbide producers use natural gas to reduce iron ore to iron carbide, which is 90% iron and 6% carbon.
Iron Ore	Mineral containing enough iron to be a commercially viable source of the element for use in steelmaking. Except for fragments of meteorites found on Earth, iron is not a free element; instead, it is trapped in the earth's crust in its oxidized form.
Interstitial Free Steel	A recently developed sheet steel product with very low carbon levels that is used primarily in automotive deep-drawing applications. Interstitial Free Steel's improved ductility (drawing ability) is made possible by vacuum degassing.
Ladle Metallurgy (LME)	Intermediate steel processing that is performed just after leaving the Electric or Basic Oxygen Furnace, but before casting, while the steel is still in the ladle. By reheating and stirring the steel, the temperature, composition and chemistry are controlled to improve the quality of the metal.

Legacy Costs	Costs that are associated with prior operations. Employee liabilities (pensions and health care benefits) and environmental cleanup costs usually are included under this moniker.
Leveling Line	Process to flatten any shape deficiencies (wavy edges and buckles) in the sheet, prior to final shipment. Most cold-rolled sheet initially has a crowned cross-section that, if such a shape is undesirable to the customer, must be flattened in the leveling line.
Light-Gauge Steel	Very thin steel sheet that has been temper-rolled or passed through a cold-reduction mill. Light gauge steel normally is plated with tin or chrome for use in food containers.
Low-Carbon Steel	Steel with less than 0.005% carbon is more ductile (malleable): It is capable of being drawn out or rolled thin for use in automotive body applications. Carbon is removed from the steel bath through vacuum degassing.
Man-Hours Per Ton	This is a measure of labor efficiency –the ratio of total hours worked by steel employees to the tons shipped for a given period of time. Changes in the inventory level and work that is contracted out will affect the reported measurement. Figures normally are announced annually to smooth any inventory distortions.
Merchant Bar	These consist of rounds, squares, flats, strips, angles and channels that fabricators, steel service centers and manufacturers cut, bend and shape into products. Merchant products typically require specialized processing and handling to match customer needs, so these products command higher prices than pure commodity steels.
Mini-Mills	This normally is defined as a steel mill that melts scrap metal to produce commodity products. Although the mini-mills are subject to the same steel processing requirements after the caster as the integrated steel companies, they differ greatly in regard to their minimum efficient size, labor relations, product markets, and management style.
Net Operating Loss (NOLs)	Income-averaging provision that allows companies with losses to either carry forward the loss up to 15 years to offset otherwise taxable future income or carry back the NOLs up to three years to receive a refund for taxes previously paid. Because of the decade of losses for most of the steel industry, few currently profitable companies actually pay any taxes; they apply their substantial NOLs to income (see FAS 109)

Nº 1 Heavy Melt	Obsolete steel scrap grade, at least one-quarter inch in thickness and in sections no larger than five feet by two feet. Much of the metal comes from demolished buildings, truck frames and heavy duty springs. Mini-mills are primary consumers of number-one heavy scrap.
Oil Country Tubular Goods (OCTG)	Label applied to the pipe products used by petroleum exploration customers. Casing, drill pipe and oil well tubing, depending on their use, may be formed through welded or seamless processes.
OPEB Expense	Other Postretirement Employment Benefits. Usually refers to health care obligations to a mill's retired workers, although its meaning also can include layoff benefits (see FAS 106)
Open Hearth Furnace	Broad, shallow hearth to refine pig iron and scrap into steel .Heat is supplied from a large, luminous flame over the surface, and the refining takes seven to nine hours. Open Hearths, at one time the most abundant steelmaking furnace among integrated companies, have been replaced by the basic oxygen furnace.
Operating Rates	Ratio of raw steel production to the mill's stated capacity. Each December, a steel company reports to the AISI its estimated capacity (if it could sell all steel they produce) for the following year, adjusted for any facility downtime.
Order Rate	Ratio of new orders recorded to the mill's capacity to produce the steel to fill the orders. Many analysts view trends in the order rate as harbingers of future production levels.
Oscillating	Method of winding narrow strip steel over a much wider roll. Customers want to have as much steel on a coil as will fit in their machines, so they can spend less time moving the material and more time using it. By coiling the strip like fishing line (or thread) over a spool, a much longer strip can fit onto a coil of proper diameter. Oscillate-wound coils allow he customer to enjoy longer processing runs.
Peak Earnings	Ultimate earnings level of a company at the top of the business cycle. This is the expected profit during the time of the highest commodity demand and the strongest product pricing.
Pellets	(See Agglomerating Processes)
Pickling	• **What.** Process that cleans a steel coil of its rust, dirt and oil so that further work can be done to the metal. • **Why.** When hot-rolled coils cool, rust forms on the unprotected metal; often coils are stored or transported while exposed to outside air and water. • **How.** Through a continuous process the steel is uncoiled and sent through a series of hydrochloric acid baths that remove the oxides (rust). The steel sheet is then rinsed and dried.

Pig Iron	Name for the cast iron produced in a blast furnace, containing a large quantity of carbon (above 1.5%) Mini-mills also may charge pig iron in their furnaces in the place of scrap. Named long ago when molten iron was poured through a trench in the ground to flow into shallow earthen holes, the arrangement looked like newborn pigs suckling. The central channel became known as the "sow", and the molds were "pigs".
Pilling (Sheet Pilling)	Steel product with edges designed to interlock; used in the construction of cofferdams or riverbank reinforcement.
Plate	Sheet steel with a width of more than eight inches, with a thickness ranging from one quarter of an inch to more than one foot (see Sheet).
Powder Metals	Fabrication technology in which fine metallic powder is compacted under high pressure and then heated at a temperature slightly below the melting point to solidify the material. Primary users of powder metal parts are auto, electronics and aerospace industries.
Pulverized Coal Injectio9n System (PCI)	Enhancement to reduce an integrated mill's reliance on coke (because of environmental problems, with its production). Up to 30% of the fuel charged into the blast furnace can be this talcum-like coal powder, which is injected through nozzles at the bottom of the furnace
Q-BOP	Modified Basic Oxygen Furnace in which the oxygen and other gases are blown in from the bottom, rather than from the top. While the Q-BOP stirs the metal bath more vigorously, allowing for faster processing, the design produces essentially the same steel grades as the top-blowing basic oxygen furnace. Today's state-of-the-art furnace design combines the previous technologies: 60% of the oxygen is blown from above with the rest blown through the bottom of the vessel.
Reinforcing bar (Rebar)	Commodity-grade steel used to strengthen concrete in highway and building construction.
Reline	Replacing the refractory lining of a liquid steel vessel. Once it wears out, the brick lining of a furnace must be cooled, stripped and replaced. This maintenance can be significant because a blast furnace reline may require up to three months to complete.
Refractory Brick	Heat-resistant brick. Because its melting point is well above the operating temperatures of the process, refractory bricks line most steelmaking vessels that come in contact with molten metal, like the walls of the blast furnace, sides of the ladles and inside of the BOF. Some brick can withstand up to 2,500 batches of steel before needing to be replaced (relined).

Residuals	Impurities in mini-mill steel as the result of the mix of meals entering the process as random obsolete scrap. Residuals are key concerns regarding the mini-mills' recent entry into the flat-rolled market, where metallurgical consistency is especially important.
Reversing Mill	Stand of rolls used to reduce steel sheet or plate by passing the steel back and forth between the rolls; the gap between the rolls is reduced after each pass.
Rod	Round, thin semi-finished steel length that is rolled from a billet and coiled for further processing. Rod is commonly drawn into wire products or used to make bolts and nails. Rod train (rolling facilities) can run as fast as 20,000 feet per minute – at more than 200 miles an hour.
Roll Force Systems	Mill stands place considerable pressure on slabs, blooms and coils to further process the material. There are two general ways of applying the force to the steel – screw and hydraulic systems. • **Screw.** (Incline Plane). This older method used the basic principle of the screw to adjust the space between the mill rolls. Because meal touches metal, these configurations will wear down over time and cause quality problems. • **Hydraulic.** (Pancake Cylinder).This modern system uses fluid pressure to rapidly adjust the roll spacing several times per second. Theses minute, instantaneous adjustments allow for superior gauge tracking and higher-quality products.
Scrap	Ferrous (iron –containing) material that generally is remelted and recast into new steel. Integrated steel mills use scrap for up to 25% of their basic oxygen furnaces is scrap. • **Home Scrap**. Waste steel that is generated from within the steel mill, through edge trimming and rejects. It normally is sent directly back to the furnace. • **Prompt (Industrial) Scrap.** Excess steel that is trimmed by the auto and appliance stampers and auctioned to scrap buyers as factory bundles. This is a high-quality scrap as the result of its low-residual content and consistent chemistry. • **Obsolete Scrap.** Iron-bearing trash, Automobile hulks, worn-out refrigerators and useless storage tanks, for example, can be recovered from the junkyard and remelted. The residual impurity of such scrap normally relegates obsolete scrap to mini-mills (see Nº 1 Heavy Melt)
Shredded Scrap	Fist-sized, homogenous pieces of old automobile hulks. After cars are sent through a shredder, the recyclable steel is separated by magnets. Mini-mills consume shredded scrap in their electric arc furnace operations.

<table>
<tr><td>Secondary Steel</td><td>Steel that does not meet the original customer's specifications because of a defect in its chemistry, gauge or surface quality. Mills must search to find another customer (that can accept the lower quality) to take the off-spec steel at a discount. While secondary will not affect a mill's reported yield, margins will suffer.</td></tr>
<tr><td>Shape Correcting</td><td>Rolling, heating and quenching steel sheets often affect the dimensions of the steel. Levelers, temper mills and edge trimmers rework the processed steel to match customer specifications.</td></tr>
<tr><td>Shearing</td><td>If the edges of sheet and strip are not controlled during reduction, they must be trimmed parallel by shears. This process may be performed by either the steel mill or steel processor to match customer needs.</td></tr>
<tr><td>Sheet Steel</td><td>Thin, flat-rolled steel. Coiled sheet steel accounts for more than one third of all steel shipped annually and is created in a hot-strip mill by rolling a cast slab flat while maintaining the side dimensions. The malleable steel lengthens to several hundred feet as it is squeezed by the rolling mill.
The most common differences among steel bars, strip,. Plate, and sheet are merely their physical dimensions of width and gauge (thickness).

<table>
<tr><th colspan="6">Product Classification by size</th></tr>
<tr><th colspan="6">Specified width in inches</th></tr>
<tr><th>Specified Thickness in inches</th><th>Up to 6</th><th>Over 6 to 8</th><th>Over 8 to 12</th><th>Over 12 to 48</th><th>Over 48</th></tr>
<tr><td>0.2300+</td><td>Bar</td><td>Bar</td><td>Plate</td><td>Plate</td><td>Plate</td></tr>
<tr><td>0.2299-0.2040</td><td>Bar</td><td>Strip</td><td>Strip</td><td>Sheet</td><td>Plate</td></tr>
<tr><td>0.2039-0.1800</td><td>Strip</td><td>Strip</td><td>Strip</td><td>Sheet</td><td>Plate</td></tr>
<tr><td>0.1799-0.0449</td><td>Strip</td><td>Strip</td><td>Strip</td><td>Sheet</td><td>Sheet</td></tr>
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</td></tr>
<tr><td>Silicon Electrical Steel</td><td>A type of specialty steel created by introducing silicon at the BOF during the steelmaking process. Electrical steel exhibits certain magnetic properties, which make it optimum for use in transformers, power generators and electric motors.

• Grain-Oriented. The metal's grain runs parallel within the steel, permitting easy magnetization along the length of the steel. Although grain-oriented steel may be twice as expensive to produce, its magnetic directional characteristics enable power transformers, made from this meal, to absorb less energy during operation.

• Non-Grain Oriented. Because there is no preferential direction for magnetization, non-grain oriented steel is best used in rotating apparatus such as electric motors.</td></tr>
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Sintering	A process done to iron ore that combines iron-bearing particles, once recovered from environmental control filters, into small pellets, Previously, these materials were too fine to withstand the air currents of the smelting process and were thrown away. The iron is conserved now because the chunks can be charged into the blast furnace (see Agglomerating Processes)
Skelp	Steel that is the entry material to a pipe mill. Resembles hot-rolled strip, but its properties allow for the severe forming and welding operations required for pipe production.
Slab	The most common type of semi-finished steel. Traditional slabs measure ten inches thick and 30-85 inches wide (and average about 20 feet long),while the output of the recently developed "thin slab" casters is two inches thick. Subsequent to casting, slabs are sent to the hot-strip mill to be rolled into coiled sheet.
Slag	Impurities in a molten pool of iron. Flux such as limestone may be added to foster the congregation of undesired elements into a slag. Because slag is lighter than iron, it will float on top of the pool where it can be skimmed.
Slitting	• **What.** Cutting a sheet of steel into narrower strips to match customer needs. • **Why.** Steel mills have limited flexibility as to the widths of the sheet that they create. Normally, it is the more specialized service centers that cut the sheet for the customer**.**
Spot Market	Sales for delivery in less than three months. These noncontract revenues represent nearly 50% of all flat-rolled steel sales and quickly reflect the impact of changing prices of the steel mills.
Steel Intensity	Amount of steel used per unit of gross domestic product. Intensity reflects the secular demand for steel, as opposed to cyclical demand. The amount of steel used in vehicles and the popularity of alternative materials affect the intensity, or how much steel is needed per widget produced. The state of the economy, however, determines how may widgets.
Steel-Intensive Products	Consumer products such as automobiles and appliances that, because so much of their weight is from steel, exhibit a high demand correlation with steel. Because the average car of 2,900 pounds is 53% steel, rising auto sales directly increase steel demand.
Steel Strapping	Banding and packaging material that is used to close and reinforce shipping units, such as bales, boxes, cartons, coils, crates and skids.

Steckel Mill	Reversing steel sheet reduction mill with heated coil boxes at each end. Steel sheet or plate is sent through the rolls of the reversing mill and coiled at the end of the mill, reheated in the coil box, and sent back through the Steckel stands and recoiled. By reheating the steel prior to each pass, the rolls can squeeze the steel thinner per pass and impart a better surface finish.
Strip	Thin, flat steel that resembles hot-rolled sheet, but it is normally narrower (up to 12 inches wide) and produced to more closely controlled thicknesses. Strip also may be cut from steel sheet by a slitting machine (see Sheet Steel).
Stainless Steel	All grades of steel containing more than 10% chromium, with or without other alloying elements. Stainless steel resists corrosion and is used widely in items such as automotive and food processing products, as well as medical and health equipment.
Statistical Process Control (SPC)	Technique used to predict when a steelmaking function may deteriorate. By monitoring the product's variance from specifications, the operator can determine when to apply preventative maintenance to a machine before any low-quality (secondary) steel is produced.
Steel Service Center Inventories	End-of-period material stocks reported by the Steel Service Center Institute (SSCI). • Months of Inventory. Ratio of the end-of-period inventory to average monthly level of sales for the period.
Substrate	Raw material used as an input for steel processing; for example, hot-rolled steel is the substrate for cold-rolling operations.
Structurals	Large steel shapes that are used for the skeleton of a building. These include, but are not limited to, I-beams, H-beams and wide-flange beams.
Taconite	Natural mineral containing less than 30% iron. It is the primary ore used in blast furnaces. Domestic supplies of iron-rich ores (greater than 50% iron) were largely depleted in the 1940s, so integrated steel companies now process the lower-grade taconite to make it useful.
Tailored Blanks	A section of sheet or strip that is cut to length and trimmed to match specifications for the manufacture's stamping design for a particular part. Because excess steel is cut away (to save shipping costs), all that remains for the stamper is to impart the three-dimensional shape with a die press (see Blanking).

Tandem Mill	A type of cold-rolling mill, the tandem mill imparts greater strength, a uniform and smoother surface, and reduced thickness to the steel sheet. Unlike the original single-stand mills, a tandem mill rolls steel through a series of rolls (generally three to five) in a row to achieve a desired thickness and surface quality.
Teeming	Pouring; ingot molds are filled (teemed) by iron-bearing ladles.
Temper Mill	Finishes cold-rolled, annealed sheet steel by improving the finish or texture to develop the required final mechanical properties. Usually only one or two stands, the rolls of the Temper Mill impart the customers' desired surface texture to the sheet, By changing the rolls, steel can be shipped with a shiny, dull or grooved surface.
Terne	Sheet steel coated with a mixture of lead and tin. Terne principally is used in the manufacture of gasoline tanks, although it also can be found in chemical containers, oil filters and television chassis.
Tin Mill	Continuous tin-plating facility to produce tin mill steel sheet to be used in food and beverage cans and other containers.
Tin/Chrome Plating	Plating process whereby the molecules from the positively charged tin or chromium anode attach to the negatively charged sheet steel. The thickness of the coating readily is controlled through regulation of the voltage and speed of the sheet through the plating area.
Tin-Free Steel	Chromium-coated steel. Because it is used in food cans just like tin plate, it ironically is classified as a tin mill product. Tin-free steel is easier to recycle because tin will contaminate scrap steel in even small concentrations.
Tolerances	A customer's specifications can refer to dimensions or to the chemical properties of steel ordered. The tolerance measures the allowable difference in product specifications between what a customer orders and what the steel company delivers. There is no standard tolerance because each customer maintains its own variance objective. Tolerances are given as the specification, plus or minus an error factor; the smaller the range, the higher the cost.
Toll Processing	• **What.** Processing steel (generally slitting) for a fee ("toll"). • **Why.** Owners of the steel sheet may not possess the facilities to perform needed operations on the material (or may not have the open capacity)**.** Therefore, another steel mill or service center will slit, roll, coat, anneal or plate the metal for a fee.

Ton	• **Gross Ton.** 2,240 pounds. Unit of measure for steel scrap and iron ore. • **Short (Net) Ton.** 2,000 pounds. Normal unit of statistical raw material input and steel output in the United States. • **Metric Ton.** 1,000 kilograms. 2,205 pounds or 1.102 short tons.
Tundish	Shallow refractory-lined basin on top of the continuous caster. It receives the liquid steel from the ladle, prior to the cast, allowing the operator to precisely regulate the flow of metal into the mold.
Vacuum Degassing	Advanced steel refining facilities that remove oxygen, hydrogen and nitrogen under low pressures (in a vacuum) to produce ultra-low-carbon steel for demanding electrical and automotive applications. Normally performed in the ladle, the removal of dissolved gases results in cleaner, higher-quality, more pure steel (see Ladle Metallurgy).
Voluntary Restraint Agreements (VRAs)	Compromise reached between the U.S. Government and foreign steel-exporting nations. Instead of the United States imposing punitive duties on subsidized steel imports, the foreigners would "voluntarily" limit their steel exports to the United States. The most recent VRA agreements expired in March 1992.
Walking Beam Furnace	A type of continuous reheat furnace in which the billet or slab moves through distinct heating zones within the furnace: By controlling the speed through the zones, steelmakers can achieve precise rolling temperatures and consume less fuel during operation.
Widths	Lateral dimensions of the rolled steel form, as opposed to the length or the gauge (thickness). If width of the steel strip is not controlled during rolling, the edges must be trimmed.
Work Rules	Unions may divide jobs into separate crafts and specify guidelines for work in the labor contract. These provisions define the duties of a specific job, and management must negotiate with the labor representative to make any changes.
Yield	Ratio of the quantity of finished shipments to the total raw steel produced, adjusted for changes in inventory and any slabs that are purchased from outside. Yield has significantly improved during the past decade, primarily as the result of the industry's conversion to continually cast steel, whose yield is superior to that of traditional ingot teeming.