



ArcelorMittal

## **MARKETS FOR PLATE STEEL**

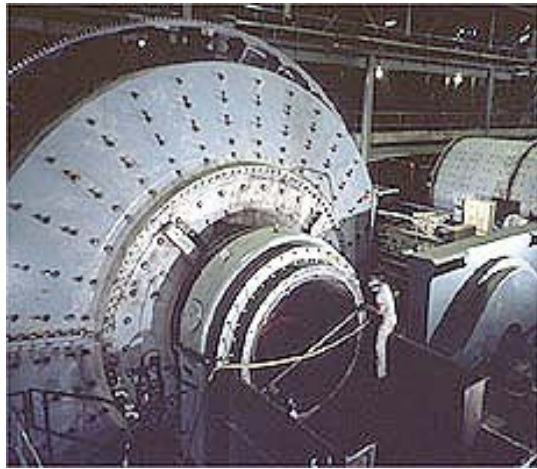
<b><u>MARKET</u></b>	<b><u>PAGE NUMBER</u></b>
Construction	2
Machinery	3
Oil & Gas	4
Rail Transportation	5
Shipbuilding & Marine Equipment	6
Automotive	7
Mining, Quarrying & Lumbering	8
Agriculture	9
Electrical Equipment	10
Military	11
Pipe & Tube	12
Aircraft & Aerospace	13

## CONSTRUCTION



- Plate steels made for the construction market are used primarily to build bridges.
- Bridge forms include "I" girders, trapezoidal boxes or truss designs, which can be found in short to long spans.
- Bridge steels are covered by ASTM A709, AASHTO M270 and a new grade HPS 70W is finding wide usage. Weathering Steels are also very popular because of lower painting costs.
- Some plate steel is used in building construction for base plates, heavy support members and splice plates. ArcelorMittal's Sure-Foot<sup>®</sup> safety floor plate is used in stairways and loading docks.
- Water storage tanks represent another segment of the construction market that uses plate steels, primarily carbon grades.

## MACHINERY



- The machinery market covers a variety of plate applications including construction and earthmoving equipment, cranes and mold, tool and die.
- Plate steels used are generally higher strength level grades.
- These steels must be weldable and formable to allow for a variety of fabrication demands.
- Individual equipment companies may specify plate steels for particular needs, or use ASTM grades e.g, A572 Grade 50 or use ArcelorMittal's branded products such as T-1<sup>®</sup> and A514, BethStar<sup>®</sup>, T-Star<sup>®</sup>, LQ-130<sup>™</sup> and MTD<sup>®</sup> and Tool Steels.
- Because of the tight tolerances needed for assembly of some machinery, laser cutting is used. ArcelorMittal's LASERReady<sup>™</sup> steels are designed for these applications.

## OIL & GAS



- The oil & gas market uses plate steel to build exploration, drilling, transmission and refining equipment for the collection, processing and distribution of petroleum-based products and natural gas.
- Specific applications include offshore platforms where API specifications cover the design e.g., API-2H Grade 50.
- Pressure vessels in oil refineries require special plate steel grades designated by ASTM and ASME specifications e.g, ASTM/ASME A516 Grade 70 and A387 Grade 22 Class 1.
- Details on these special products are covered in ArcelorMittal's Pressure Vessel Steels, Roll-Bonded Clad and 9% Nickel brochures.

## RAIL TRANSPORTATION



- Plate steel is used to construct structural portions of rail cars that support or contain cargo.
- Car types include tank cars for carrying liquid cargo and hopper cars for hauling grain or other solid materials. An example steel grade is AAR-TC128.
- Coal cars often use Weathering Plate Steel grades containing copper, such as ASTM A588 for corrosion resistance. A 12 percent chromium utility stainless grade, Duracorr<sup>®</sup>, is being used to construct rail cars for hauling coal and other corrosive materials.
- Plate steel, primarily carbon grades, is used in the structural parts of locomotives.

## **SHIPBUILDING & MARINE EQUIPMENT**



- The shipbuilding market consumes significant amounts of carbon and HSLA plate steels.
- Shipyards use plate steel for production of bulk carriers, barges, and container and cruise ships.
- Most steel made for ship construction is specified by the American Bureau of Shipping (ABS). ABS specifications cover a variety of carbon and HSLA grades e.g., ABS-A and ABS-EH. The ASTM A131 specification also lists all ABS steels in a similar form.
- U.S. Navy ships use significant amounts of alloy armor plate steels in surface and submarine applications.

## AUTOMOTIVE



- Plate steel is not used directly in automotive construction; however, it is used to fabricate heavy axles for trucks.
- Automotive plate often is rolled from carbon or HSLA steels that are cut into the shape of an axle during the initial fabrication step.
- Plate steel is used in the presses to cold form automotive sections or in plastic injection molding equipment. MTD and Tool Steels are plate steel grades used in these applications, as are ArcelorMittal's Free-Machining Steels.

## MINING, QUARRYING & LUMBERING



- Mining, quarrying & lumbering applications use a variety of plate steels.
- Mining equipment includes power shovels and dragline buckets for above ground use and underground equipment, such as that used in longwall mining.
- Quarries use plate steel for digging apparatus and in chutes for conveying aggregate.
- Because these applications are abrasive, high strength steels such as T-1<sup>®</sup>, and A514, and LQ-130<sup>™</sup> and abrasion-resistant grades such as Hardwear<sup>®</sup> 400F and 500F are widely used.
- Lumbering operations use plate steel in saws, shear blades and structural elements made from ArcelorMittal's BethStar<sup>®</sup>.

## AGRICULTURE



- Plate steel is used selectively for certain parts of agricultural equipment, including harvesters, plows and tillers.
- Carbon and HSLA steels most often are specified using ASTM standards or the equipment manufacturers' specifications.
- Because of their improved weldability, ArcelorMittal's T-Star<sup>®</sup> and BethStar<sup>®</sup> are often used.

## ELECTRICAL EQUIPMENT



- Various parts of electricity generation and distribution equipment are built from plate steel.
- Electrical utilities, nuclear or fossil-fuel based, use plate steel to form pressure vessels that contain steam needed for power generation.
- Hydroelectric applications use plate steel to construct turbines, penstocks and other related equipment.
- Carbon steels, ASTM A516 or alloy grades, ASTM A533B, are used widely in electrical generation equipment.
- Transmission towers carrying high voltage lines and utility poles often are constructed from Weathering Steels, such as ASTM A871. Utility poles frequently are painted or made from galvanized ASTM A572 plate steel.
- Roll-Bonded Clad is used as an economical corrosion resistant liner in new flue gas desulfurization (FGD) systems and chimneys.

## MILITARY



- Carbon steel and military alloys are used widely for Army and Navy applications.
- Plate steel used in military applications is produced to military specifications, labeled as MIL-A-XXXXX for Army and MIL-S-XXXXX for Navy use. Most of these steels have commercial equivalents or similar grades in ASTM, e.g. Spartan<sup>TM</sup> and A710 Steels.
- Military Alloy armor grades for Navy and Army applications are quenched and tempered and tested to very stringent requirements
- These plate sizes are used in armored tanks, personnel vehicles and submarines, aircraft carriers and cruisers.

## PIPE & TUBE



- The pipe & tube market uses discrete and coiled plate steel. Fabricators form plate into pipe and tubing.
- Pipe is used to transport petroleum products, natural gas or water. Specifications for these applications vary by use and geographic location, e.g. a gas line in Canada has more stringent requirements than a water pipe in Florida. API specifications form the basis of most petroleum-based applications.
- Pipe and tube applications typically use carbon or HSLA steels. Duracorr<sup>®</sup> is a 12 percent stainless steel available in sheet form for tubing

## AIRCRAFT & AEROSPACE



- Plate steel is not used extensively by the aircraft & aerospace market. However, the industry does require "aircraft quality" plate steels for specialized parts. These grades are produced to ArcelorMittal's Fineline<sup>®</sup> clean steel practices for excellent internal quality.
- Although very little plate steel becomes part of an aircraft, the machine tools, forming presses and other equipment used to fabricate aircraft parts are built from a variety of plate steels (see Machinery).