

ATI 9™

Nonmagnetic, Modified Hadfield Steel: Austenitic

GENERAL PROPERTIES

ATI 9™ plate is a nonmagnetic, high tensile strength steel, which displays high toughness and outstanding wear resistance for an austenitic steel. It is similar to the Hadfield steel family except it contains nominal 4.40% Cr and 3.25% Ni whose presence increase corrosion resistance relative to Hadfield steels. As with the Hadfield steels, ATI 9™ alloy exhibits a high work hardening rate. Applications include winding drums for steel cables, coal chutes, mine cars, coal stripping equipment, earth moving equipment, rail car parts, housings for magnets and transformer wedges.

TYPICAL COMPOSITION

Element	Weight Percent
Carbon	0.40
Manganese	12.35
Phosphorus	0.050 max
Sulfur	0.030 max
Silicon	0.50
Chromium	4.40
Nickel	3.25
Molybdenum	0.50
Iron	Balance

FORM AND CONDITION

ATI 9™ steel is available as plate in the as-rolled condition from ATI.

HEAT TREATMENT

ATI 9™ plate is not annealed. It is supplied and used in the as-rolled condition. Moreover, this alloy is not hardenable by heat treatment.

HOT WORKING

ATI 9™ plate can be hot worked by heating to a temperature in the 2050 to 2200°F (1121 to 1204°C) range and finished in the 1300 to 1800°F (704 to 982°C) range to achieve the desired strength.

Technical Data Sheet

TYPICAL MECHANICAL PROPERTIES

Tensile and Hardness*	
Yield strength, 0.2 % offset (ksi)	50 to 70
Ultimate tensile strength (ksi)	115 to 130
Elongation in 2 inches (%)	40 to 60
Reduction of Area (%)	40 to 55
Modulus of elasticity	29×10^6
Hardness, Brinell	197 to 234

*Tensile properties are for 1.50" to 2.00" thick plates.
Thinner plates will show higher strength and lower ductility.

Impact Resistance	
Charpy V-notch	45 to 80 ft-lbs at 0.375" thick
Charpy V-notch	90 to 180 ft-lbs at 0.625" thick

PHYSICAL PROPERTIES

Density, lb/cu. in.	0.286
Specific gravity, g/cu. cm	7.91
Coefficient of Thermal Expansion, 20 to 1000°C	22.2×10^{-6}
Magnetic Permeability	1.002 at -30C
(H=300 oersteds)	1.004 at 25C 1.005 at 150C

FABRICATING CHARACTERISTICS

ATI 9™ plate can be bent 180 degrees around a mandrel whose diameter is 2X plate thickness for plates under 0.750" (19.05 mm) thick.

It is difficult to machine due to its high work hardening rate. Employ rigid tool set up, fast feeds and slow speeds. Machining behavior is similar to the Hadfield steels.

ATI 9™ plate demonstrates good weldability. Use 308, 309, 316L or 29-9 welding electrodes after cleaning surface to remove scale, dirt and other debris.