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### About Carbon Steel, Alloy Steel, Spring Steel, and Cast Iron

Steel is known for its strength, machinability, and weldability. It lacks corrosion resistance; however, coatings such as zinc galvanizing increase its ability to resist rust. If corrosion resistance is more important to your application than strength, consider stainless steel. For more information, see [About Stainless Steel](#).

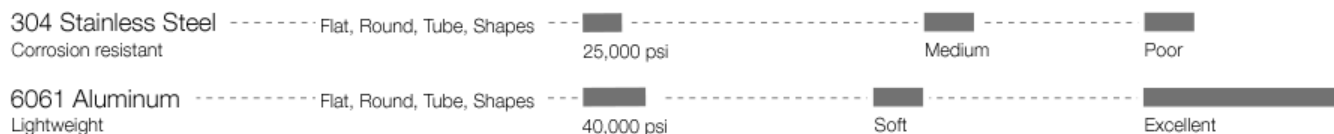
If you are machining tools that cut, form, or shape other materials, tool steel is especially well-suited for those applications. For more information, see [About Tool Steel](#).

#### Alloy Comparison

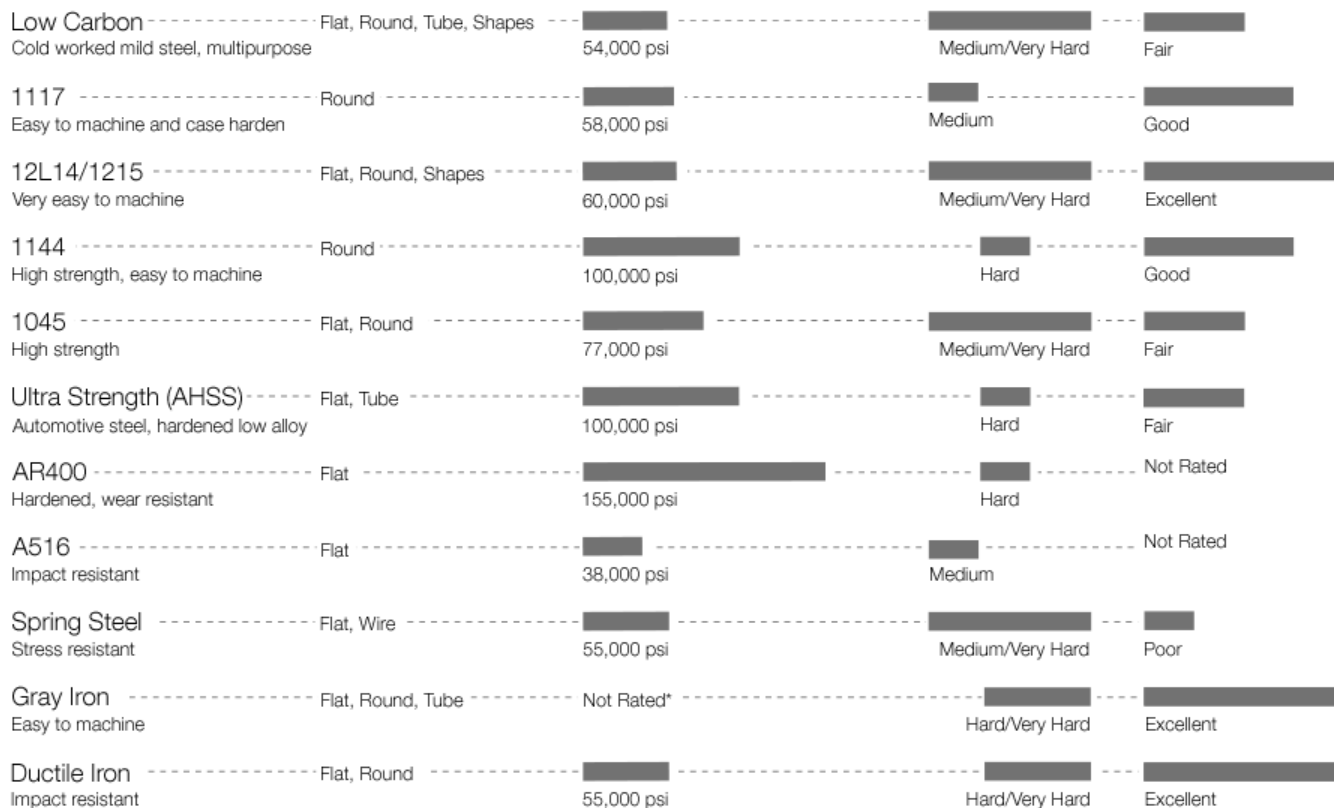
Use the chart below to compare attributes and identify the best steel for your application. We've included the ratings for 304 stainless steel and 6061 aluminum to provide a reference for how steel measures up to these familiar materials. The ratings are provided for comparison only and are not intended for design purposes.



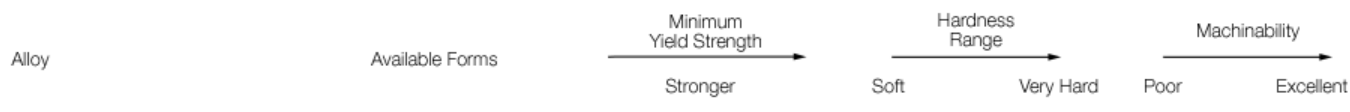
#### Compare to other metals:



### Carbon Steel, Spring Steel, and Iron: An economical choice for machining and structural applications



\* Gray Iron has a tensile strength of 40,000 psi, but is brittle and does not deform without breaking.

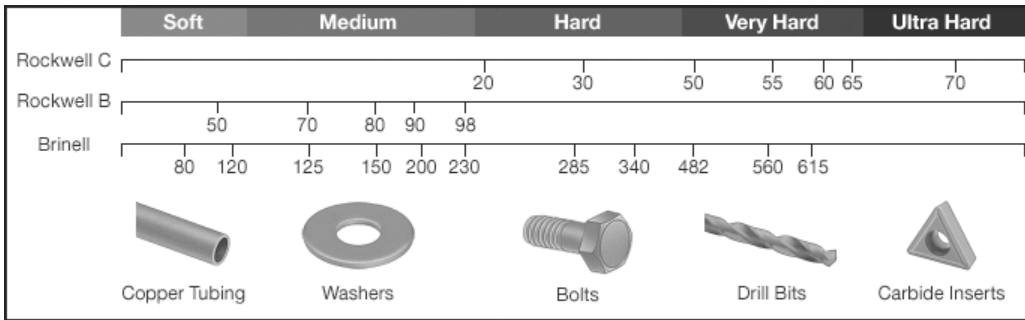


Alloy Steel: Greater strength and toughness after hardening than carbon steel, making it useful for high-stress applications

4140	Flat, Round, Tube, Shapes	60,000 psi	Medium/Very Hard	Fair
4130	Flat, Round, Tube	52,000 psi	Medium/Very Hard	Fair
4150	Round	55,000 psi	Medium/Very Hard	Fair
4340	Round	68,000 psi	Hard/Very Hard	Poor
8620	Round	56,000 psi	Medium/Very Hard	Fair
E52100	Flat, Round	62,000 psi	Hard/Very Hard	Poor
A514	Flat	100,000 psi	Hard	Not Rated
9310	Round	162,000 psi	Very Hard	Poor
C300	Round	100,000 psi	Hard/Very Hard	Poor

**Hardness**

As hardness increases, metal becomes more wear resistant, but it may also become less malleable. Metal hardness can be measured on a Brinell scale or on one of the Rockwell scales. The scales have some overlap; therefore, if a metal has a hardness rating of Brinell 70, it is the same hardness as Rockwell B34.



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**About Tool Steel**

A combination of high strength, hardness, and wear resistance makes tool steel especially well-suited for use as cutting tools and as tools that form and shape other materials.

If you are looking for material that can be machined into parts and structural components, consider one of our other types of steel. For more information, see [About Carbon Steel](#), [Alloy Steel](#), [Spring Steel](#), and [Cast Iron](#).

If corrosion resistance is an important factor in your application, consider stainless steel. For more information, see [About Stainless Steel](#).

**Alloy Comparison**

Use the chart below to compare attributes and identify the best tool steel for your application. The ratings are provided for comparison only and are not intended for design purposes.

For cutting tools, such as drill bits and end mills, look for a material that has high wear resistance and hot hardness.

For forming tools, such as die blocks and extrusion tools that slide against other parts, choose a material with high wear resistance.

For shearing tools, such as blades and trimming dies that are subject to stress, select a material with high wear and shock resistance.

For molds, including plastic molding dies, look for a material with high machinability and wear resistance.

Alloy	Available Forms	Wear Resistance		Shock Resistance		Hot Hardness		Machinability	
		Poor	Excellent	Poor	Excellent	Poor	Excellent	Poor	Excellent
<b>O1</b> Oil hardening, multipurpose	Flat, Round	Fair		Fair		Fair		Fair	
<b>A2</b> Air hardening, multipurpose	Flat, Round	Good		Fair		Good		Fair	
<b>D2</b> Wear resistant	Flat, Round	Excellent		Poor		Good		Poor	
<b>W1</b> Water hardening, easy to machine	Flat, Round	Poor		Fair		Poor		Excellent	
<b>S2, S7</b> Shock resistant	Flat, Round, Ball	Poor		Excellent		Poor		Fair	
<b>H13</b> High temperature	Flat, Round	Fair		Excellent		Good		Fair	
<b>M2, M4, M42, M50</b> High speed	Flat, Round, Ball	Good		Fair		Excellent		Poor	
<b>P20</b> Mold steel, easy to machine	Round	Poor		Excellent		Poor		Good	

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