



## Pipe (6061-T6)

QQ-A-200/8, ASTM B221

The following specifications cover Aluminum 6061

### Physical and Mechanical Properties

**Ultimate Tensile Strength, psi:** 45,000

**Yield Strength, psi:** 40,000

**Brinell Hardness:** 95

**Rockwell Hardness:** B60

### Chemistry Data:

**Aluminum:** Balance

**Chromium:** 0.04 - 0.35

**Copper:** 0.15 - 0.4

**Iron:** 0 - 0.7

**Magnesium:** 0.8 - 1.2

**Manganese:** 0.15 max

**Other:** 0.15 max

**Remainder Each:** 0.05 max

**Silicon:** 0.4 - 0.8

**Titanium:** 0.15 max

**Zinc:** 0.25 max

### Physical Data

**Density (lb / cu. in.):** 0.098

**Specific Gravity:** 2.7

**Melting Point (Deg F):** 1090

**Modulus of Elasticity Tension:** 10

**Modulus of Elasticity Torsion:** 3.8

6061 Aluminum is, by most any measure, the most commonly used aluminum alloy. It is specified in most any application due to its strength, heat treatability, comparatively easy machining, and weldability. If that were not enough, it is also capable of being anodized, adding a layer of protection for finished parts. The main alloy ingredients of 6061 aluminum are magnesium and silicon.

### Principal Design Features

Probably the most commonly available, heat treatable aluminum alloy.

### Applications

Commonly used in the manufacture of heavy-duty structures requiring good corrosion resistance, truck and marine components, railroad cars, furniture, tank fittings, general structural and high pressure applications, wire products, and in pipelines.

### Machinability

Machinability in the harder T 4 and T6 tempers is good. It is notably less easy to machine in the annealed temper.

### Forming

Easily cold worked and formed in the annealed condition. Stamping, bending, spinning, deep drawing are all readily accomplished using standard methods.

### Welding

The alloy has very good welding characteristics and may be welded by all of the common welding techniques. Gas tungsten arc welding is generally used for thin sections (less than 0.032") and gas metal arc welding is used for heavier sections. Use alloy 4043 filler wire for best results, although a decrease in T 6 properties will result.

### Heat Treatment

Solution heat treat at 990 F for adequate time to allow for thorough heating and then water quench. Precipitation hardening is done at 320 F for 18 hours and air cool, followed by 350 F for 8 hours and air cooling.

### Forging

The alloy is capable of being hot forged at temperatures in the range of 900 F to 750 F.

### Hot Working

Hot working may be done in the temperature range of 700 F to 500 F.

### Cold Working

Cold working in the O temper condition is readily performed. The alloy is notably less easy to cold form in the T 4 and T 6 tempers.

### Annealing

Annealing should be done at 775 F for 2 to 3 hours followed by controlled cooling at 50 f per hour down to 500 F, then air cool.

### Aging

The aging precipitation heat treatment is done at 350 F for 8 hours followed by air cooling. This produces the T6 temper.

### Tempering

Not applicable.

### Hardening

See "Aging".

### Other Physical Props

Electrical conductivity 40% of copper.

