What's in This Aluminum Grades Chart?

First, why use aluminum? Practically a miracle metal, aluminum is almost as popular as steel. It also has some important advantages over steel. For example, aluminum is:

Less than ½ the weight of steel, so it's ideal for certain vehicles (i.e. aerospace) and household items (think patio furniture you want to be movable).
When it corrodes, it actually forms a protective layer to prevent further breakdown.
Fairly resistant to corrosion from chemicals, including salt.
Reflective, making it perfect for many uses, including decoration,highly conductive of both heat and electricity, so it's good for transmission cables, heat exchangers, appliances,and many other applications.
Non-ferromagnetic,non-pyrophoricandnon-toxic,making it useful in electronics, flammable and explosives material handling, and food packaging.
Softness makes it easy to fabricate into almost any shape or thickness
Aluminum is so adaptable in large part because of its alloys, and these alloys are what create aluminum's different grades.
You'll want to keep handy this chart, which accurately outlines these alloys and their uses.
Getting your material right is a time-saving and potentially cost-saving win for your project.

Aluminum Alloy Categories

GRADE	TYPE	TRAITS	USES
355.0	Cast	Very hard. Good machinability and corrosion resistance	Cylinder heads
A356.0	Cast	General purpose alloy. High strength and good castability. Great corrosion resistance	Aircraft parts, pump housings, structural applications, pump housings, impellers
A360	Cast	High strength when treated. Average machinability, good corrosion resistance	Low-pressure applications, motor housings, cover plates
A380.0	Cast	Very hard. Good machinability and fair corrosion resistance	Electronics chassis, household furniture, tools, engine brackets, gearbox cases

A413	Cast	Poor machinability. Excellent corrosion resistance. Softer than other popular cast alloys	Thin sections, manifolds
514.0	Cast	High magnesium content, promoting hardenability through heat treatment and strain hardening. Also adds susceptibility to intergranular corrosion.	Commercial food processing
712.0	Cast	Good shock resistance. Nice strength at elevated temperature. One of most expensive cast alloys. High zinc content; also includes chromium. This limits weldability	Decorative, farm machinery, machine tool parts, marine castings
1100	Wrought	Excellent corrosion resistance, workability. High thermal and electrical conductivity	Food packaging trays
1350	Wrought	Excellent corrosion resistance, workability. High thermal and electrical conductivity	Electrical applications
2014	Wrought	Easily machinable in certain tempers. Among the strongest aluminium alloys. High hardness. Difficult to weld, as it's subject to cracking. Commonly extruded and forged. Corrosion resistance is poor.	Cycling frames and components
2024	Wrought	Copper used as the principal alloying element and can be strengthened significantly through solution heat-treating. Good combination of strength and toughness, but lower atmospheric corrosion resistance than many other aluminum alloys	Most widely known aircraft alloy

3003	Wrought	Moderate strength and good workability. Manganese is the major alloying element	General purposes, heat exchangers, cooking utensils
3004	Wrought	Can produce tempers with higher strength but lower ductility. Manganese is the major alloying element	Soda can bodies
4043	Wrought	Silicon's addition lowers the melting point without producing brittleness	Filler alloy for structural and automotive applications
4047	Wrought	Unique; used as cladding or filler alloy. Filler strips can be combined to bond two metals.	Aerospace, automotive
5052	Wrought	Moderate to high strength, as well as good weldability and resistance to corrosion in marine environments.	Electronics, marine craft, other marine applications
5059	Wrought	Resistant to saltwater corrosion	Marine craft, other marine applications
5083	Wrought	Highest strength of non-heat-treated alloys. Good weldability and resistance to corrosion in marine environments.	Marine craft and applications, U.S. military's Bradley Fighting Vehicle, inner auto body panels
5086	Wrought	Resistant to saltwater corrosion	Marine craft, other marine applications
		Moderate to high strength, as well as good	

5182	Wrought	weldability and resistance to corrosion in marine environments.	Soda can lid
5754	Wrought	Moderate to high strength, excellent weldability	Inner auto body panels, auto frames
6061	Wrought	Heat treatable, highly formable, weldable. Moderately high strength and highly corrosion-resistant. Contains silicon and magnesium	Truck, cycle, and marine frames; general purpose; marine craft, breathing gas cylinders for scuba
6063	Wrought	Heat treatable, with moderately high strength. Excellent corrosion resistance. Can be successfully extruded.	Architectural and structural, marine craft, other marine applications, auto and cycling frames and components
6111	Wrought	Good corrosion resistance and precipitation hardening	External auto body panels
6351	Wrought	Heat treatable, highly formable, weldable. Moderately high strength and nice corrosion resistance	Breathing gas cylinders for scuba
6951	Wrought	Heat treatable to provide additional strength	Aircraft fins, heat transfer and exchangers for aerospace
		Relative ease of welding and manufacture.	

7005	Wrought	Does not need heat treating. Similar physical properties to 6061, except with higher density and (depending on temper) possibly slightly higher strength	Less expensive bicycle frames
7050	Wrought	Heat-treatable, incredibly strong alloy. Zinc is primary alloying agent. Magnesium, copper, and chromium exist in small quantities.	Aircraft structures, aircraft parts, high-stress applications
7075	Wrought	Heat-treatable, incredibly strong alloy. Zinc is primary alloying agent. Magnesium, copper, and chromium exist in small quantities.	Aircraft manufacturing where highest strength possible is a must, cycling frames and components
7475	Wrought	Heat-treatable, incredibly strong alloy. Zinc is primary alloying agent. Magnesium, copper, and chromium exist in small quantities.	Aircraft manufacturing where highest strength possible is a must

How Does the Aluminum Grades Chart Work?

Aluminum alloys break down into a couple of broad categories: **wrought and cast** composition. Wrought and cast alloys are each then divided again into categories depending on the mechanism that develops their properties. Very simply put, engineers use either heat treatment or mechanical methods (sometimes both) to develop wrought and cast aluminum alloys.

Now comes the tricky part. The Aluminum Association has devised a **four-digit alloy classification system** to separate alloy families (for example, 3xxx) for wrought alloys and a three-digit plus decimal system (for example 2xx.x) for cast alloys. The digits tell you the alloy's chemical composition. The decimal attached to the codes for cast alloys refer to alloy limits, but don't put too much thought into them.

An example of how to use this chart to your benefit is this: If you're looking for a high-strength metal to use in building aircraft, you probably want copper as an alloying metal. But say your specs call for more magnesium and other metals. You can go to your chart and start with #2 on the wrought composition section because it contains alloys with copper as the main alloying metal. Then it's just a matter of adding the right amount of magnesium and any other specified elements.

Narrow It Down Yet?

There are more than 500 aluminum alloys registered with the Aluminum Association. You can see how having a chart on hand helps cull the herd rather quickly. It's all about getting the right metal for your project, saving you from **wasting time and money on a redo**.

Getting your metal manufacturer involved early in the design process can also benefit your project's success rate. The right vendor will know which metal is best for your project and which ones are readily available, saving you lead times and maybe even cost.