Aluminium Federation Fact Sheet
04 2020

ALUMINIUM EXTRUSIONS

Introduction

At moderately high temperature aluminium becomes very low strength and deformable, which enables it to be readily extruded, a property that sets aluminium apart from most other metals.

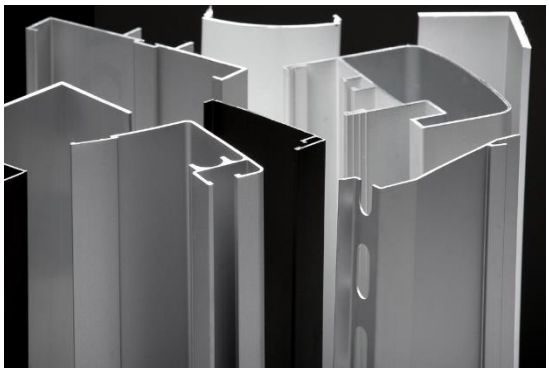
Aluminium's high strength-to-weight ratio, and its ability to be extruded into any shape, no matter how complex, with tight tolerances, make it an ideal material for design applications which require maximum versatility from a cross-sectional area.

The Process

Aluminium extrusions are produced by heating aluminium billets to approximately 500°C and then extruded by forcing through a shaped steel die. As the extruded section emerges it is cooled and cut to the desired length. Heat treatment is then used to optimise the material's inherent mechanical properties.

Extrusion Benefits

- Most versatile of all metal forming processes
- Designers "Can put metal where it is needed"
- A "Nett Shape Process"
- Post extrusion machining not always needed



Less fabrication and machining after extrusion means that there is greater design potential because intricate shapes may be extruded, reducing the need to manufacture component parts for future assembly. Some shapes achievable by extrusion are unattainable by any other process.

Low prototype costs, the cost of tooling aluminium extrusions is low compared to that of roll forming, casting, forging and moulding of competing materials.

The Products

The range of alloys available in the form of extrusions offers a choice to suit most applications. The versatility of the extrusion process coupled with the ideal properties of aluminium alloys of lightness, strength, corrosion resistance and formability mean that aluminium extrusions are widely used in architecture, transport and general engineering.

Very complex, tight tolerance aluminium extrusions enable window and door sections to be fabricated with painted or anodized finishes that are long lasting, with good thermal properties.

Machining characteristics also tend to improve with increasing strength and if a free machining alloy is required for use on automatic lathes, then alloy 2011, which includes small lead and bismuth additions, is the ideal choice. Other specialised alloys include 1350 and 6101A for electrical applications, where low resistivity is the important feature and alloy 6463 for chemical brightening purposes.

Probably the best combination of medium strength, good surface finish and corrosion resistance, with excellent anodizing properties, is provided by the 6060, 6063 and 6082 alloys with tensile strengths in the range 190 to 310 MPa, which account for the very large tonnages supplied by the aluminium extrusion industry.

Alloys 2014A, 7020 and 7075 with tensile strengths ranging from 470 to 570 MPa are used for high strength applications.

Selection of Extrusion Alloys
The following table gives a selection of alloys with characteristics and typical applications.

Alloy Designation	Characteristics	Typical Applications
6060	Intricate sections	Construction
	Medium strength	Consumer products
	Good surface finish	General engineering
	Good corrosion resistance	
6463	Intricate sections	Bright Coloured Anodising
	Medium strength	
	Good surface finish	
	Good corrosion resistance	
6063	Intricate sections	Construction
	Medium strength	Consumer products
	Good surface finish	General engineering
	Good corrosion resistance	

6082	Medium/high strength	Transport
	Good corrosion resistance	Scaffolding
		Bridges
		General engineering
6005	Very good corrosion resistance	Transport
	Good weldability	Structural engineering
	Medium strength	Precision engineering
	Good extrudability	
2618	High strength	Engine components
		Piston rings
		Compressor blades
5083	Excellent corrosion resistance	Specialised applications, e.g.:
	Excellent weldability	Highly stressed marine structures
	Medium strength	Pressure vessels
		Cryogenic applications
7020	High strength	Specialised applications, e.g.:
	Good weldability	High strength welded structures
	Elevated temperature forming	

Further information about aluminium and aluminium alloys, their production, fabrication and end use can be obtained from:

- Aluminium Federation www.alfed.org.uk
- European Aluminium Association in Brussels www.european-aluminium.eu
- International Aluminium Institute in London www.world-aluminium.org