

Aluminium Applications 2 - Aluminium in Building and Construction

Introduction

In just 100 years, aluminium has advanced from being a rarely used metal to the second largest metal used worldwide. The characteristics and properties which have brought about this dramatic increase in the use of aluminium are its light weight, high strength, resistance to weathering, ease of forming, the ability to be treated in a variety of finishes, and finally its recyclability.

Aluminium is used in building and construction to cover a wide spectrum of different applications including factory buildings with flat aluminium roofing, incorporating foil vapour barriers, prestigious buildings where aluminium windows and preformed sheet cladding features predominate, replacement windows, patent glazing, shop fronts, doors, canopies, architectural hardware and fittings, rain water goods and many other applications. Aluminium structures and cladding are also being used to refurbish many of the concrete structures of the 1950's and 1960's which are showing signs of deterioration and spalling. Such treatment prevents further erosion of the structure with the additional benefit of energy saving due to the insulating properties of the aluminium cladding, and enhancing the external appearance of the building.

Alloy Properties and Forms

The aluminium cast and wrought alloys commonly used in building - alloys with additions of magnesium (LM5, 5083, 5251), manganese (3103), silicon (LM6) or a combination of magnesium and silicon (LM25, 6063, 6082), all possess great durability with a high resistance to atmospheric attack, both in industrial and marine environments.

By selecting the right alloy, the designer is offered a wide range of properties including high strength - up to 400 MPa, low density - one third that of steel, high thermal conductivity and good forming and joining characteristics. These alloys are used in the building and construction industry in the form of rolled products and extrusions, castings, forging - the extrusion process deserving particular mention since it is a unique method of shaping aluminium, offering the designer a vast range of extruded profiles, and almost limitless design possibilities.

Durability of Aluminium

An example of the long term durability of aluminium is the decorated aluminium sheet cladding on the dome of the San Gioacchino Church in Rome which was installed in 1887, and is still in excellent condition with virtually no maintenance. Nearer to home, aluminium castings were used for the construction of the Eros statue in Piccadilly Circus, erected in 1883, and still in pristine condition in an area polluted by car exhaust emissions.

Finishing Aluminium

Whilst aluminium and its alloys are strong and durable, with a natural ability to form a protective oxide layer when exposed to the atmosphere, decorative finishes are often required. These can be produced either by anodising, where natural or coloured oxide films are available, or by coatings using powder, wet spray or electrophoretic techniques. A wide range of colours are available which are durable, fade free and widely used in architecture.

Markets and Applications

In the UK, over 150,000 tonnes of aluminium are used by the building and construction industry each year, a large proportion of which is in the form of extruded and rolled products.

A major outlet for extrusions is the window market, both for commercial and domestic buildings. The complex shapes achievable by extruding, enables the designer to incorporate features such as grooves for joining, draft excluders, thermal break requirements and glazing beads which, with the combination of strength, all contribute to the high performance aluminium windows.

Amongst the many other applications for aluminium extrusions in building are:

1. Roofing and exterior cladding
2. Curtain walling and structural glazing
3. Prefabricated buildings, greenhouses and conservatories
4. Public works machinery and equipment
5. Scaffolding and ladders
6. Architectural hardware
7. Heating and ventilation
8. Shopfronts and signs
9. Partitions

Rolled aluminium has a thousand and one uses in modern construction. As profiled sheet, available in a variety of finishes, it makes the ideal roofing material. Aluminium sheet is the preferred material as a decorative or protective cladding to buildings which were originally designed with this material in mind or as a highly cost effective way of preventing further discolouration or spalling in existing concrete structures. In heating, ducting and ventilation installations, rolled aluminium can meet the demand of almost any specification. Foil lined plasterboard is an example where rolled aluminium enhances a product's longevity and insulating properties. Flashings and guttering illustrate the durability of this versatile material, with the additional advantage that rolled aluminium components can be "tailored" on site

Advantage and other aluminium components can be carried on site to a specific application and eliminate the need to transport very long sections to the site.

Recent Developments

The use of aluminium sheet, plate and extrusions in the construction of offshore rigs and equipment, has gained wide acceptance. In such a hostile environment, it is essential that the materials of construction possess high strength and great durability. The aluminium alloys selected for this demanding application possess high resistance to corrosion and a level of mechanical properties which will satisfy the specified design requirements, often without the need for any additional surface treatment. Add to this, the weight saving benefits achievable with aluminium and it becomes the automatic choice for many applications in rig construction.

A striking example of construction, inspired by marine principles, is the NatWest Media Centre at Lords Cricket Ground. Of semi-monocoque construction, the structure makes use of rolled and extruded products incorporating a specially selected pale-blue interior. The sections of the building were constructed in a shipyard and taken by road to London for the final erection of the building.

Every two years the prestigious Aluminium Imagination Awards are held. Now well established as the UK's premier award for design excellence in the architectural application of aluminium, the Awards provide inspirational examples of both practical and beautiful design. Sponsors of the Awards include the Aluminium Extruders Association, the Aluminium Finishing Association and the Council for Aluminium in Building - all are member associations of the Aluminium Federation.

In keeping with 21st Century attitudes to environmental responsibility, the aluminium industry makes special efforts to ensure that new work in building and construction pays special attention to sustainable development. This is achieved by careful design ensuring economic use of appropriate alloys and the employment of improved building techniques. This philosophy includes the return of aluminium from initial construction via recycling - an average use cycle of some 40 years. Recycling rates of over 95% are achieved year on year because of the high intrinsic value of aluminium products and the ease with which it can be recycled.

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

(1) European Aluminium Association in Brussels
<http://www.aluminium.org/>

(2) International Aluminium Institute in London
<http://www.world-aluminium.org/>

