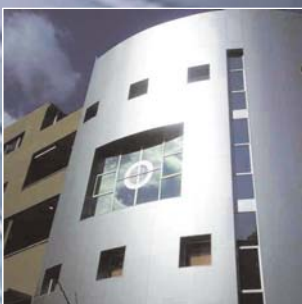


# ARCHITECTURAL ALUMINIUM SURFACE FINISHING GUIDE



**AFSA**  
ALUMINIUM | SOUTH  
FEDERATION | AFRICA

Aluminium - light, strong and beautiful

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ALUMINIUM | SOUTH ALUMINIUM SURFACE FINISHERS  
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Aluminium - light, strong and beautiful

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ASFA is an Association operating under the aegis of the Aluminium Federation of South Africa.

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#### ASFA

The Aluminium Surface Finishers Association (ASFA) is committed to improving the performance of the South African Aluminium Surface Finishers Industry. ASFA is an Association operating under the aegis of the Aluminium Federation of South Africa (AFSA).



## The Aluminium Surface Finishers' Association (ASFA)

ASFA is an Association operating under the aegis of the Aluminium Federation of South Africa (AFSA) and supports and represents member companies in South Africa involved in the surface finishing of aluminium. Special emphasis is on the architectural, industrial and commercial building markets. Its scope includes matters of common interest and concern in the fields of aluminium surface finishing, relevant quality and environmental management and related research, technical advice and technology transfer.

- ASFA supports performance improvement of the South African Surface Finishing industry.
- All members have accepted and are committed to the ASFA Quality Accord.
- Industry stakeholders include companies engaged in aluminium finishing, suppliers of products and services to the finishing companies, purchasers of anodised and coated products and specifiers of surface finishes

## The Aluminium Federation of South Africa (AFSA)

The Aluminium Federation of South Africa (AFSA), is an Industry Association of South African companies involved in the aluminium industry. It represents and promotes the South African aluminium industry, both regionally and internationally. AFSA aims to:

- Promote the usage of aluminium and the growth of the aluminium industry in South Africa.
- Promote, represent and defend the interests of its members in matters where joint action will achieve benefits greater than that of individual members and/or companies.
- Provide a link between the suppliers of aluminium products and their markets and to facilitate an understanding of and access to the suppliers of aluminium products.
- Provide technical information through a support service, and maintain relevant technical data.

The purpose of this Guide is to improve the understanding of Surface Finishing, what it can achieve and how to ensure a quality product.

To achieve a Surface Finish that conforms to requirement in terms of appearance and service life requires the preparation of the aluminium and the finishing to be carried out to established standards.

## ALUMINIUM FINISHES FOR THE ARCHITECT

**This Architectural Aluminium Surface Finishing Guide has been produced by the Aluminium Federation of SA to assist the architectural profession to...**

- Select from the wide range of architectural products, finishes, materials, shapes and forms available from the aluminium industry.
- Understand and specify architectural finishes for optimum performance and aesthetic effect.
- Take advantage of accreditation systems to national or industry standards for confidence in supply, service and sources of expertise.
- Exploit these technologies creatively and flexibly.
- Take advantage of the "green" and economically recyclable qualities of aluminium where over 75% of all aluminium ever smelted can be traced to current use.



## The Architectural Aluminium Surface Finishing Guide

**This Guide** is produced by the Aluminium Federation of South Africa, AFSA, and the Aluminium Surface Finishers' Association, ASFA, as a tool for the architectural profession and related interests in South Africa to:

- Assist them in the optimum selection and specification of surface finishes on architectural aluminium with some in-sight into the technology involved.
- Promote the use of quality South African products which are certified for lengthy and satisfactory service and appearance for such applications.
- To encourage the use of those South African suppliers and products which are committed to manufacture to the best technology for long service.

The terminology used recognises the regional specifications, codes and resources used in South Africa. The Guide aims to extend the already impressive array of architectural achievements with aluminium in South Africa and to promote improved technologies where these are purposeful.

This Guide focuses on architectural usage. However, an earlier AFSA publication, "The Aluminium Surface Finishing User's Guide", will be helpful to those interested in similar metal finishing technologies used for many other applications and markets. These include decorative and hard anodising, electrolytic polishing, coatings for printing and packaging applications, specialised finishes for defence uses and electrochemical plating.

### Aluminum as an Architectural Material

Aluminium is a remarkable material having a unique combination of properties which make it suitable for many different applications in a variety of manufactured shapes, systems and alloys. It is commonly used and is often the material of choice in many sectors of the architectural market.

It thus becomes the substrate and structural component in numerous architectural applications, curtain wall systems, windows and shop-fronts, industrial and commercial roofing, siding and paneling and architectural furniture and features of all types. Although a versatile and durable substrate it is often improved with painted or anodised finishes to give an appropriately durable and preferred appearance.

Aluminium is a light metal whose strength, durability and decorative properties can be optimised for particular purposes by alloying with other metals. It has good strength over a wide range of temperatures and excellent corrosion resistance. The thin oxide film, which forms naturally on the surface, provides an effective barrier to the elements. Various surface finishes applied to this surface can make the appearance more attractive and durable.



Aluminium has many other important properties which are discussed in the AFSA publication - "Introduction to Aluminium".

### Aluminium and the Environment

Aluminium can be infinitely recycled without loss of its metallic properties.

75% of all aluminium ever produced is still in use.

Converting Alumina ( $Al_2O_3$ ) to aluminium metal is energy intensive. However, remelting aluminium saves 95% of the energy required to produce primary aluminium. The global average for recycled aluminium is 50%, effectively halving the energy used. In the building and construction industry, the recovery rate is over 90%.

The high strength to mass ratio, durability, corrosion resistance and recyclability of aluminium make it an environmentally friendly material.

### The Aluminium Substrate

For a wide range of applications, aluminium and its alloys have the advantage that they are protected by the material's natural hard and inert surface oxide layer. This is formed in air and aerated water and re-forms instantly whenever the metal is cut or abraded. This oxide film inhibits corrosion and consequently, in some uses such as industrial and agricultural roofing and cladding, aluminium is routinely supplied in "mill finish". An early example of the mill finish extrusions is the Johannesburg Jeppe Street Post Office built in 1935. Many railway Goodsheds in Durban (Bayhead) and other coastal areas are roofed with profiled aluminium sheet in mill finish dating from the 1970's.

The demands of appearance, aesthetics and corrosion protection have however, relegated mill finish to those situations where corrosion is slow and the product does not need to be decorated. The surface finishes that are included in this Guide fall into the three main groups of anodising, powder coating and coil coating - mostly on extruded shapes or rolled aluminium sheet.

All illustrations used in this Guide are of South African produced materials and surface finishes.

## What is Surface Finishing

If the appearance of the normal "mill finish" is not acceptable to the architect or if additional protection is required, aluminium can be treated with a wide range of coatings or finishes to give an enhanced appearance. Modern finishes can be specified to give a visual durability appropriate to the longevity of the aluminum substrate and with a wide range of architectural colours.

The most commonly used finishes for architectural aluminium are summarised in Table 1 ie:

- Anodising (anodic oxidation).
- Powder Coating.
- Coil (Wet) Coating.

Related processes, which can be used to modify the metal surface before painting or anodising are:

- Mechanical surface treatments and texturing.
- Chemical Brightening and Etching.
- Conversion Coating (chromate or non-chrome) is an essential intermediate layer before all powder or coil coating to ensure the long term, in service, integrity of the metal-paint interface

All three finishing processes (anodising, powder and coil coating) are based on a long history of development and proven technology. They are all factory based processes, involving significant investment in equipment and technology. All have the potential for a long service life, given use of the optimum technologies and quality management and controls. The simplest way for the architect and specifier to ensure that the best practices are being used is to specify in terms of the recommendations of this Guide and to ensure the Applicators of the finish are certified in terms of SANS specifications or are Qualicoat or Qualanod certified. Applicators approved by SANS certified powder suppliers are similarly appropriate.

## Points to Consider

The performance of the surface treatments depends directly on the quality of the surface preparation. Also anodising, powder and coil coating are complex processes which are continually being improved. Inefficient processing may negate the benefit of such technology and suppliers should insist on adherence to SANS or equivalent standards to ensure the finish performs in the expected manner.

Other specific criteria may be relevant, when specifying surface finishes:

### • Alloy temper of the aluminium to be anodised.

Various combinations of alloying elements, dependent on the alloy of the product being anodised, may cause variations, especially in colour and film density, even if treated to identical processing. Your anodiser will advise and demonstrate any differences for a specific combination. The common extrusion alloys, 6063 and 6060, from reputable suppliers, would give standardised responses.

### • Mechanical Finish.

If specified, mechanical finishing is done before chemical processes or anodising. These give surface textures or remove surface defects and irregularities. The appearance can be varied, but usually give a uniform matt finish, directional or non-directional sanded finish, or a specular (mirror-like) effect. The mechanical finish shows through because un-coloured anodic oxides are transparent or translucent and anodic oxides conform to the surface texture. Examples of such finishes are buffing, sanding, sand blasting, grinding and shot peening.

Grinding requires a rotary grinder with a bonded adhesive cup wheel or canvas wheel faced with suitable abrasives. Low speed grinding (1500mm/min) using aluminum oxide is preferred to avoid overheating the surface.

Machine polishing requires wheels or belts that have abrasives either bonded to them or sprayed onto the wheel at regular intervals. Both contact and mush polishing methods are used - the latter being more common. Polishing can include a buffing operation to remove emery marks.

### • Chemical Finish in preparation for anodising.

Etching gives a frosted matte surface appearance, while electro or chemical polishing produces a specular, mirror-like finish. Chemical treatment is done prior to anodising and has a major effect on the final appearance of the anodised part. The pre-anodise chemical treatment of aluminium is often called the cleaning, clean-up or pre-treatment phase of the process.

Electro and chemical polishing techniques are used to smooth the metal surface through relative attack on the outstanding points of the surface where the surface to volume ratio is higher. As a result a bright finish is achieved. A typical application would be shower-doors.



King Shaka International Airport, Durban

# TYPES OF SURFACE FINISHING

**TABLE 1: Types of Surface Treatment for Architectural Use**

Technique	Technology Type	Characteristics
ANODISING	Electrochemical	Gives a hard, natural or coloured oxide layer up to 25 microns. Attractive appearance often in shades of bronze and black. Excellent resistance to pitting corrosion and wear.
<b>Ancillary Treatments prior to Anodising</b>		
	Chemical Brightening Etching	Removes surface texture and gives a mirror finish. Anodising film usually <15 micron. Chemical pretreatment in a variety of etchants, which leaves matt or silky finishes, and which may show through the anodic film.
	Mechanical Preparation Grinding/Brushing  Polishing and Buffing  High Finish Polishing	Gives a silk or matt appearance and a flat, even surface.  Removes die-lines, tool marks and surface blemishes, grinding lines and stress raisers.  Mirror finish - usually followed by bright anodising
<b>ORGANIC COATING</b>		
	Powder Coating	Gives a wide range of architectural colours, including white, in a single or two coat oven cured powder system. Durable and attractive. Wood grain finishes mainly for exterior use, but must be specified for this purpose.
	Coil Coating	Single or two coat paint finish, applied in high volume and high technology aluminium coil coating line. Long service life. More limited range of colours available. Roofing and siding for building industry.



## Did you know...

Roofs in mill finish profiled sheet still maintain their original properties, meeting design criteria and trafficability long into their service life.

*Moses Mabhida Stadium, Durban*



# ALUMINIUM AND ATMOSPHERIC CORROSION

Aluminium enjoys the advantage of a hard, inert oxide film that forms instantaneously when the metal is cut or abraded. This oxide film inhibits corrosion and as a result, in some uses such as industrial and agricultural roofing and cladding, aluminium is routinely supplied in mill finish. Even windows, doors and casements can be supplied in mill finish.

The demands of corrosion resistance, surface protection and aesthetics have, however, relegated mill finish to those situations where corrosion is slow and the product does not have to be finished in a specific brand colour or where dulling and roughening of the surface is not important.

**TABLE 2: The Corrosivity Categories** (as applied in Table 4, page 7)

Category	Description
C1	Very low
C2	Low
C3	Medium
C4	High
C5	Very high

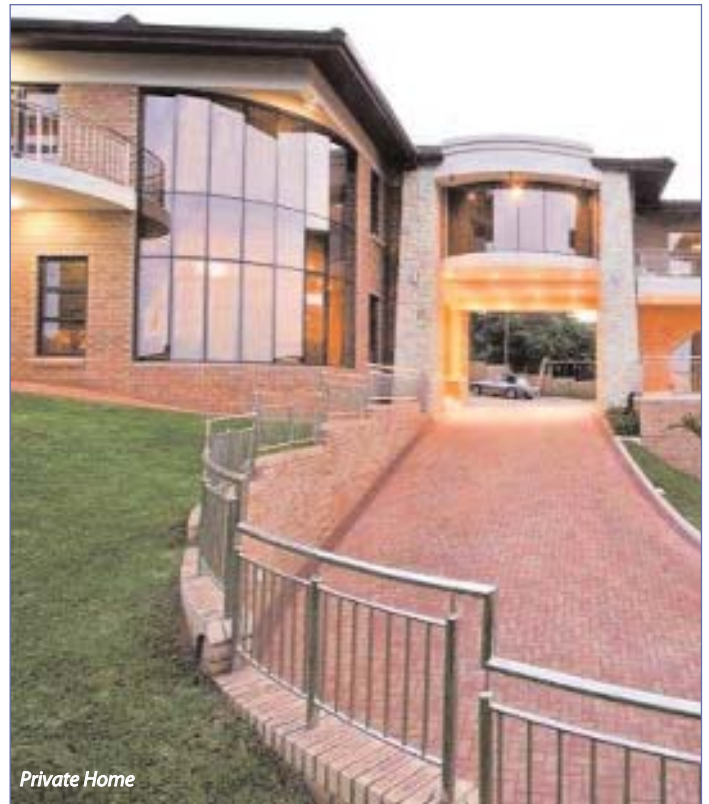
**TABLE 3: Atmospheric Corrosion in South Africa Comparing performance of Aluminium vs Galvanised Steel sheeting**

Description	Type of corrosion	Mild steel* corrosion rate $\mu\text{m/yr}$	Galvanised steel sheet** life in years <sup>^</sup>	Aluminium sheet life in years +++
Intertidal to 5km inland	Severe marine	100 - 300	Up to 3	15
Desert marine (mists)	Severe marine	80 - 100	0.5 - 2	15
Temperate marine	Marine	30 - 50	3 - 7	20
Sub-tropical marine	Medium to severe marine	50 - 80	3 - 5	>20
Desert inland dry	Desert	<5	>30	>30
Inland	Rural	10 - 20	>20	>30
Inland urban	Inland industrial ++	15 - 40	5 - 15	20
Urban coastal	Marine industrial ++	50 - 150	1 - 3	20
Inland arid	Semi desert	5 - 10	> 30	> 30

## KEY:

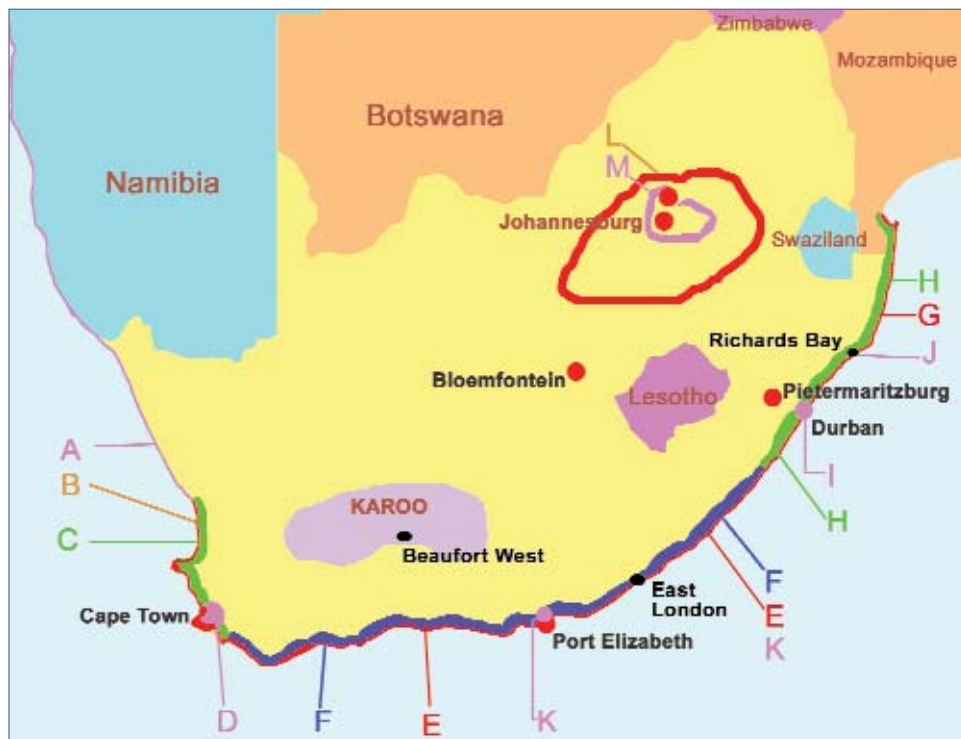
- \* Higher corrosion rate usually indicates proximity of sea.
- \*\* Commercial grade Z 275g/m<sup>2</sup> (unpainted).
- <sup>^</sup> Life in years - until 5% of surface area showing red rust.
- ++ Industrial implies pollution present in atmosphere.
- +++ Service Life. Generally aluminium has a long life, maintaining structural strength and trafficability. Localised pitting and corrosion will eventually occur.

Temperate marine & Sub-tropical marine usually from 5km inland up to first mountain range.



## NOTE:

- Metal corrosion depends on time of exposure to moisture and relative humidity and temperature.
- Rate of corrosion reduces rapidly the greater the distance from the sea.
- For aluminium, aggravating conditions can be a strong sulphurous atmosphere, the occurrence of chloride salts and stagnant water - but the right aluminium alloy still outperforms copper, zinc and carbon steel! Regular cleaning and surface coatings reduce the effect on aluminium.
- Pitting corrosion in aluminium may be unsightly, but it is not structurally significant.



**TABLE 4: Corrosivity areas derived for Southern Africa with associated ISO corrosivity ratings**

Code	Geographic Area	Distance from Ocean	Description	ISO Category	Comments
A	Namibia and NW Cape shore-line	To 5 km	Desert shore-line and coastal fog zone	Above C5	N. of Olifants River
B	W. Cape Atlantic shore-line	To 3 km	Arid shore-line with fog or strong winds	Above C5	False Bay to Olifants River
C	W. Cape coastal	To 5-15 km	Coastal area	C4	To range of fall-out of salt aerosols
D	W. Cape urban	To 25 km	Coastal urban/industrial	C5	Cape Town and Surrounds
E	S. and E. Cape shore-line	To 1 km	Temperate shore-line	C5	Distance from ocean varies with terrain
F	S. and E. Cape and Natal south coastal	To 5-10 km	Temperate coastal	C4	Distance from ocean varies with terrain
G	KZN shore-line	To 4 km	Subtropical shore-line	Above C5	KZN to Maputo
H	KZN coastal	To 15-25 km	Sub-tropical coastal	C4	
I	Durban urban	To 10 km	Urban and industrial, inland of shore-line	Upper C5	Amanzimtoti to Durban North
J	Durban urban	To 15 km	Urban and industrial, inland of shore-line	Lower C5	
K	Coastal cities	To 10-15 km	Industrial and heavy traffic areas	Lower C5	Areas of Port Elizabeth, East London, Pinetown
L	Highveld general area	-	Rural and suburban areas	C3	
M	Highveld urban and industrial	-	High-traffic urban, or close to heavy industry	C4	East Rand, areas of Pretoria, Witbank

Remainder of the region: C2 to lower C3 depending on climate.

**TABLE 5: Recommended Specification of Anodised Coating Thickness** (Please refer to the map on page 7)

	Code	Distance from sea or source of corrosion agents (km)	Exterior use - Recommended micrometres (µm)	Interior use - Recommended micrometres (µm)
Western Cape (West of Hermanus)	C	<2 2 - 25 >25	25 25 15	25 15 15
Southern and Eastern Cape	E, K	<2 2 - 20 >20	25 25 15	25 15 15
Natal South Coast (south of Amanzimtoti)	F	<2 2 - 15 >15	25 25 15	25 15 15
Durban area and Natal North Coast	G, H, I, J	<2 2 - 25 >25	25 25 15	25 15 15
Near a chemical or related process plant	M	<5 >5	25 15	25 15
In areas where windborne sand may be abrasive (Western Cape Coast and the Karoo around Beaufort West)		Not Relevant	25	15
Other areas		Inland	15	15

## Corrosion Resistance

Many decades of experience with applications in a variety of markets including construction, land-based installations and shipbuilding have shown that aluminium and its alloys in the 1000, 3000, 5000, 6000 and 8000 series have excellent resistance to atmospheric corrosion and to marine, urban and industrial environments.

Combined with its light weight, aluminium's excellent corrosion resistance accounts for the growth of aluminium applications and offers users a number of advantages:

- aluminium equipment can have a very long service life. It is not uncommon to find roofing, wall cladding panels, marina installations and boats with decades of service behind them. This is also true in the field of transport and many other applications,
- aluminium maintenance is minimal even when no extra protection (painting, anodising) is provided. When aluminium is protected, repairs are fewer and less urgent because the parent metal generally resists corrosion very well. Aluminium alloy products do not entirely eliminate the need for maintenance, especially in buildings. It is well known that surfaces that are not

cleaned are more sensitive than others, and that a surface build-up can aggravate corrosion (this is true of all metals and alloys).

- aluminium's corrosion resistance maintains the appearance of the equipment made from it. This is a useful sales argument, especially in industries where users want to keep their products looking good for less cost. Commercial vehicles, outdoor municipal amenities and traffic signs (indicator boards, gantries) are good examples of this.

Finally, the process of anodising to a depth of a few microns can help create and preserve visual properties (high-quality reflectance for retro-reflectors) or decorative features (luxury packaging for cosmetics, decorative paneling for buildings).

Aluminium's resistance to corrosion comes from the oxide surface which is impermeable and integral with the base metal, staying stable for pH values between 4 and 9. The most frequent types of corrosion are galvanic, pitting and crevice corrosion. Galvanic corrosion can be easily prevented by inserting an insulating material between the two different metals or by cathodic protection. Pitting can be prevented by surface coating and crevice corrosion by judicious design. More information is given in the AFSA Pocket Guide No 3, "Corrosion Resistance of Aluminium".

## Selection of Powder Coating Material

**TABLE 6: Selection of Powder Coating Material**

Location	Service Life Expectation	Coating Type & Thickness
Exterior All areas	10 to 15 years	Standard Polyester 60 microns to SANS 1578 or Qualicoat Class 1 from an Approved Applicator.
	15 to 25 years	Super-durable Polyester, 60 microns, to Qualicoat Class 2 and from Approved Applicator.
	25 years +	Hyper-durable PVDF, 80-110 microns two coat system to Qualicoat Class 3. NOTE: Subject to availability in South Africa.
Interior - Non Corrosive		Epoxy-Polyester or Polyester 35 microns, to SANS 1274
Interior - Durable		Epoxy-Polyester or Polyester 50 microns, to SANS 1274.

### NOTE:

- Reference should be made to the Section on Powder Coating and to the relevant SANS or Qualicoat specs for more detailed information.
- For increased corrosion protection both the standard and super-durable Polyester powders can be supplied in a two coat system of 110 microns.



## Surface Finishes Comparisons

**TABLE 7: Finishing Comparisons.**

Showing the optimum characteristics achievable with specified film types appropriate to the given site conditions, architectural design life etc. All finishes need regular care depending on the location and installed life. After installation, surfaces should only be cleaned with suitably approved cleaning materials - see detailed recommendations on page 20.

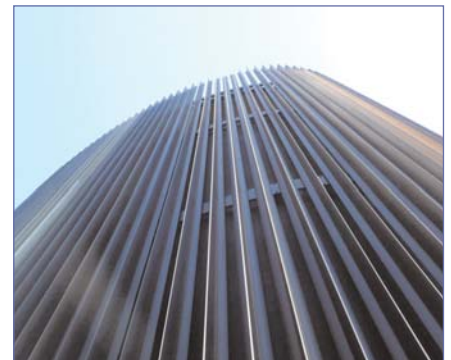
Parameter	Anodising	Powder Coating	Coil Coating
Specifications (ensure relevant use of most current revision)	SANS 999, 1407 and SANS 10322 apply. Also Qualanod certification. BS EN 755 applies to surface characteristics of extrusions.	SANS 1578, 1274, 1796 and SANS 10322 apply. Also Qualicoat certification. BS EN 755 applies to extrusion surfaces.	ASTM D3663 for PVDF fluorocarbon. AAMA 605.2.92 for baked organic coating.
Colour range	Extensive range but some are unsuitable for exterior use. Critical to specify end use and location. SANS 1091 applies.	Full range available for either interior or exterior use, including white. Critical to specify end use and location.	Dependent on type of coating used, a large range is available. PVDF (polyvinylidene fluoride) colours are limited.
Appearance	Anodising gives a crisp, clean, metallic appearance - in natural or colour finish.	Powder coating is opaque and available in various colours and gloss levels.	Coil Coating is opaque and available in standard colours or subject to quotation.
Colour fastness	Exterior anodising has excellent light fastness, - ref optimum colouring system. See Anodising Section.	Colour fastness is excellent given correct specification for powder type and pigmentation.	Colour fastness is excellent given correct specification for coating type and pigmentation.
Coating thicknesses	5 - 25 microns depending on application.	60 to 80 microns for single coat. Double coat in 110 microns.	20 to 45 microns.
Life expectancy	Up to 25 years or more -dependent on the film thickness specified and colouration used.	15 - 25 years or more dependent on powder type specified and from Approved Applicators.	Up to 25 years or more dependent on the paint type specified.
Installation	Anodising is prone to damage by wet mortar and certain acids. Protect during installation.	Powder coating is resistant to mortar, but should be protected during installation with LOW TACK tape.	Long lasting mortar resistance but may need temporary protection during installation.
Abrasion resistance	Hard surface, long lasting abrasion resistance.	Not abrasion resistant, but long lasting.	Inert coating with good general resistance.
Maintenance	Wash down with a neutral detergent every 3 to 6 months.	Wash down with a neutral detergent every 3 to 6 months.	Roofs and vertical cladding require minimal maintenance. For other areas, wash regularly with a neutral detergent.
Common applications	On aluminium extrusions, sheet, plate and castings.	On aluminium extrusions, sheet, plate and castings.	Roofing sheet, cladding and utility sheet from coil only.
Corrosion Resistance	If appropriate film thickness is specified - excellent resistance against marine and industrial atmosphere attack.	Protects the underlying substrate if correctly treated prior to coating. Also resists UV degradation if correct powder has been used.	Good corrosion resistance if correct design, fixing, crevice, joining, etc. principles are followed.
Specialised Finishes	Etched, polished, brightened, brushed, sanded, shot blasted, etc on metal substrate.	Matt, satin, gloss, speckled, structured, metallic, etc on paint surface.	Standard gloss level on paint surface or by special arrangements.



Melrose Arch, Johannesburg



Crystal Towers, Cape Town



Circa Gallery, Rosebank

## Introduction to Anodising

Anodising is a factory based process that electrolytically thickens and toughens the naturally occurring protective oxide layer on an aluminium surface. Depending on the process, the resulting finish is one of the hardest known substances. The anodic coating is integral with the metal. It is transparent and has a controlled porous structure into which organic or inorganic colorants can be deposited, achieving a wide range of popular, durable architectural colours. The anodic layer is sealed to lock in the colour and ensure a long service life, especially in outdoor architectural applications.

Certain other metals can be anodised, but largely for specialised and exotic purposes. Aluminium can be anodised with a variety of established techniques such as barrier, chromic acid, hard anodising and phosphoric anodising. Sulphuric acid anodising is commonly used for architectural applications. More information on the other anodising types can be found in the earlier AFSA publication "Aluminium Surface Finishing Users' Guide".

## Attributes of Anodising

- Visual appearance through a natural anodised finish or a variety of colours.
- Long service life for the anodic film and the coloration.
- Protection against weathering and the typical powdery weathered surface on bare aluminium.
- Surface hardening and abrasion and wear resistance.
- An environmentally sensible finish.

## The Architectural Anodising Process

For architectural (protective and decorative) or similar applications, the commercial process uses sulphuric acid anodising to create a film up to 25 micron in thickness.

- Typically, an anodising plant consists of a series of tanks in parallel, containing the chemical solutions for the various stages of the process - cleaning, degreasing, etching, de-smutting, rinsing, anodising, colouring, sealing etc.
- The load consists of cut lengths of architectural extrusions, loaded manually onto a rack which conveys the batch from one tank to the next. This is suitable for short and flexible runs and standard film thicknesses and colours.
- Cut edges will be anodised as will most exterior, visible surfaces.
- Some anodisers use cold or mid-temperature sealing techniques and should ensure these are equivalent in performance to a hot seal for long life applications.
- Other forms of aluminium, such as sheet metal work or castings, can be anodised but should be discussed with an Approved Anodiser as special techniques may be necessary.

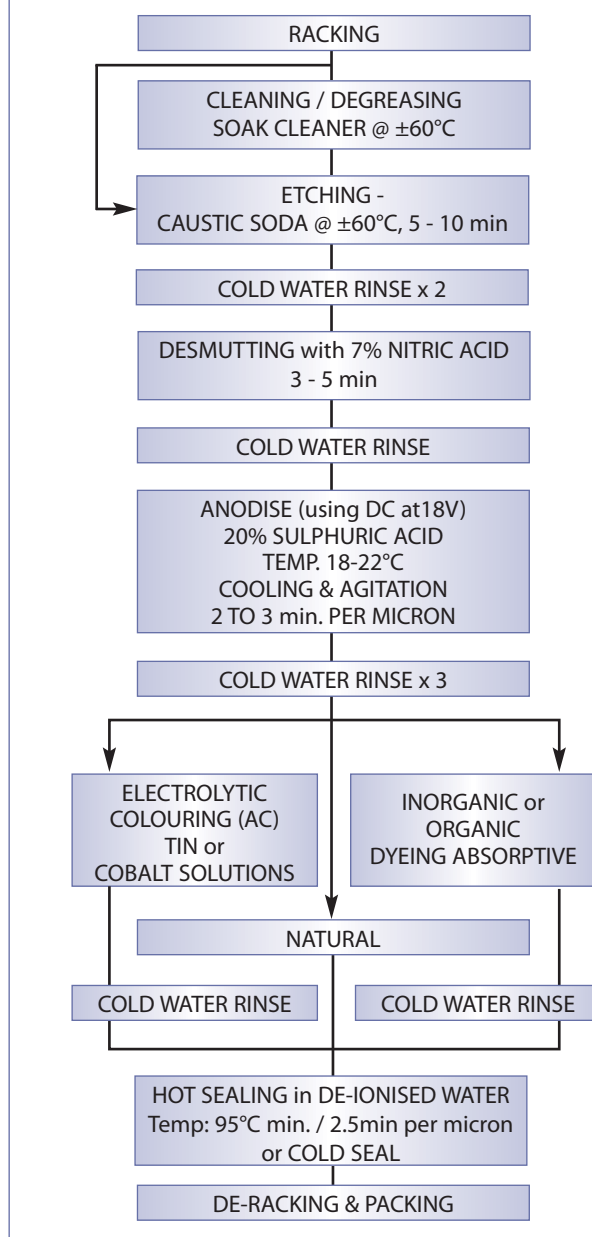
Anodising is a high capital cost process and the technology of each stage is important. The customer should ensure an anodiser is selected with an appropriate certification and quality management system to ensure the technology used is appropriate and optimally controlled.

## Choice of Anodised Film Thickness

The natural oxide thickness is about one micron, which is sufficient to protect aluminium against many corrosive environments. However, over time, the surface can develop a powdery, dull and sometimes pitted appearance. Usually this has little effect on structural properties.

Anodising, under controlled conditions, increases this film thickness up to 25 microns or more. In practice, standard film thicknesses, of up to 25 microns are recognised. The thicker films out-perform the thinner proportionately and will give a longer life but at a slightly

Figure 1: Typical Architectural Anodising Process Flow Chart



higher cost. Very thin films are suitable only for decorative and interior trim applications. The 25 micron film is recommended for coastal and industrial applications and where service life of 20 years or more is expected.



The thickness of the aluminium oxide coating can be varied by the anodising process time. The following figures are usual.

TABLE 8: Standard Anodised architectural finishes

Nominal Film Thickness and SANS definition	Architectural Application
10 micron AA10	Suitable for interior applications and outdoor use where cleaning is very frequent e.g. caravan trim and medium service life.
15 Micron AA15	Recommended for the majority of interior architectural requirements and products subject to mild atmospheric conditions and rural environments free from industrial pollution and marine influence, such as inland use.
20 micron	A 20 micron film is sometimes used in less aggressive coastal and industrial applications especially where the service life expectations are less critical.
25 micron AA25	Recommended for heavy duty outdoor permanent architectural applications, where little deterioration can be tolerated, in coastal, industrial and marine environments.

The Colouring and Finishing Processes for Anodic Films

a) Natural Anodising.

For many anodised applications for aluminium, the "natural anodised", silvery finish is often used without colouring the anodic film. It offers an attractive appearance and provides additional protection of the aluminium surface. The finish is durable, dependent on the film thickness.

b) Colouring Options.

Anodic films produced for architectural aluminium are translucent and retain the "silvery" appearance of aluminium.

However, the coating produced by sulphuric acid anodising can be treated by several techniques to give a variety of colours and shades.

In this process, pigments are deposited in the minute pores of the anodised layer. The standard types are:

- Inorganic Dying**  
The colouration of heavy metal hydrates is deposited in the outer layer of the anodic film. Colours pale to dark bronze and gold tones. Some are used for exterior architectural purposes.
- Organic Dying**  
Distinctive spectral colours such as deep yellow, red, blue and black can be achieved, typically for decorative purposes and not for out-door service.



- Electrolytic Colours**  
Metal salts are deposited electrolytically at the base of the anodic film to produce colours which are light fast and resist leaching. Various shades of bronze, greys and black are commonest:

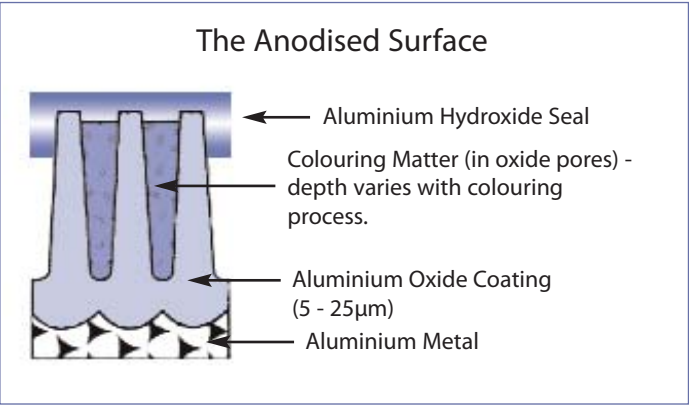
The Colour Codes have become industry standards and are recognised by ASFA members. The above colours are typical of those supplied but are subject to some tolerance in colour range, which should be taken into account when different sections are being assembled.

Anodisers may use different technologies e.g. for etching and sealing which may give different visual appearances. Standardising on one anodiser for each project will give a more consistent appearance. The Anodiser will provide samples of the standard colours, and give advice on colour options, their durability and colour variations that can be expected.

c) Bright Anodising and Mechanical Finishing.

The appearance of the anodised aluminium can be enhanced by treatment of the metal surface before the anodic film is formed - to give matt, satin, linished and polished effects. Most architectural aluminium is etched during the conventional anodising process to give a standard, clean, uniform surface. However, there are options such as chemical brightening and mechanical finishes which are used extensively in the lighting industry and for shop fronts, partitioning, shower doors and architectural accessories and features etc.

- Offers architects and designers more than the standard architectural colours.
- Popular choices include bright silver, gold and brass. Other colours such as bronze, black, blue and red are available. However, not all colours are light and weather-fast
- A common process is chemical brightening on an alloy such as 6463, which requires special care to avoid damage to the surface to be brightened. However 6060 and 6063 are often used for convenience of supply.
- Extrusions can be polished to remove scratches before brightening. Other mechanical finishes can be used to linish or texture the surface before anodising



- After brightening or mechanical finishing, the extrusions are almost invariably anodised to preserve the bright appearance with a 5 or 10 micron film. Thicker films reduce optical clarity, but thin films are less durable in aggressive conditions.





## The Substrates

All aluminium alloys can be anodised for protective purposes. However, only certain aluminium alloys are formulated specifically and normally used for architectural applications. These give a clear, un-blemished and attractive appearance, and are available in a form which is suitable and cost effective for architectural designs e.g. extrusions.

The most recognised alloys for architectural anodised finishes are:

- **Extrusions (6XXX Alloy series)**

6063 and 6060 alloys usually in the hardened T6 temper are most commonly used for anodised extrusions. Modern extrusion technology gives a clear oxide film and a metallurgical quality which ensures a uniform and attractive appearance. The extrusions should be sourced from a known, reliable extruder, using an optimal level of technology. This ensures a predictable anodising response and avoids defects which only show up after anodising.

6005 is used where a higher strength is needed.

6061 and 6082 are engineering alloys and normally anodised for protective purposes only

6463 is similar physically to 6063 but is a specially formulated alloy for chemically brightened applications such as shower doors etc, but may be subject to enquiry.

- **Sheet**

1200 alloy will give a clear anodic film, but the supplier should advise on the appropriate grade for a uniform anodised appearance.

- **Castings**

Most casting alloys contain silicon which causes a non-uniform, grey anodised appearance. Alloys such as Al99,5/LM0 and CEN 51000/LM5 may be used, but early collaboration with an Anodiser experienced with such products is recommended.

## Appropriate Specifications and Quality Assurance

SANS 999	Anodised Coatings on Aluminium for Architectural Purposes
SANS 1407	Anodised Coatings on Aluminium for General Applications
SANS 10322	Standard for Surface Finishing of Architectural Aluminium

Comprehensive and relevant specifications are:  
It is recommended to source from certified mark-holders using these standards. Qualanod and ISO certifications are other relevant options.

AFSA and ASFA member companies are all committed to meeting the required specifications. Such finishes must conform to requirements in terms of film thickness and uniformity, seal quality, abrasion and UV resistance and accelerated salt spray performance.

## Source of Defects in Anodised Surfaces

These defects are listed for information, but are less likely to be experienced with material and finishes produced by qualified suppliers.

- Substrate defects from the use of unsuitable alloys or unqualified extrusion suppliers:  
Film coloration, non-uniform appearance, metallurgical faults
- Defects originating during work piece preparation:  
Stains, streaking, cloudiness, spotty discoloration
- Defects originating from anodising itself:  
Rainbow coloration, corroded appearance, spotty film, uneven film, discoloration, hairline cracks, burnt spots
- Defects originating during coloration:  
Colour variation, mottled colours (light and dark), not abrasion resistant, colour not light fast, colour cloudy

## Working with your Anodiser

Before agreeing to have material anodised, it is important for the purchaser to review certain process parameters with the Anodiser. These include:

- Minimum and maximum rack lengths.
- Jigging marks, especially on pre-cut and long items. Long, flimsy sections may need additional jigging support in the centre.
- Possible colour variations and colour range limits.
- Correct spacing.
- Any critical surfaces.
- Effect of moisture and packaging (especially adhesives - including Sellotape) on the uncoated surface.
- Minimum order size and value.

### HOW TO SPECIFY

- Select approved material suppliers and Anodisers - SANS mark-holders or Qualanod certified. See back cover of this Guide.
- Define anodic finish in terms of:
  - Film thickness. Refer to section - "What Anodised Film Thickness to Choose" above
  - Colour and type, suitable for environment expected. Refer to section - "Colouring and Finishing Processes" above.
- SANS standards applicable e.g. SANS 999 or 1407 (current year).
- Anodising criteria. Refer to section - "Working with your Anodiser" above..
- Protective tape and packaging.

### FLUSH GLAZING SEALANTS

Specialised Silicone Sealants are used for flush glazing in architectural applications which require optimum durability and permanent adhesion to aluminium surfaces - mill finish, powder coated and anodized. The sealant manufacturer's recommendations should be strictly followed, which typically specifies manual cleaning techniques and the use of a specific "primer" to the aluminium surface to avoid premature loss of adhesion."



Nelson Mandela Bay Stadium, Port Elizabeth

## Introduction

Powder coating is an advanced method of applying a decorative and protective finish to aluminium, creating a wide range of products that are used by both industries and consumers. The process results in a uniform, high quality and attractive finish. The powder coating industry continues as the fastest growing finishing technology owing to cost and environmental requirements. Powder costs less to apply than liquid paint that provides equivalent performance.

The powder coating process is environmentally friendly as it is virtually pollution free. Unlike liquid paint, no solvents are used. Negligible amounts of volatile organic compounds (VOC's) are released into the atmosphere. In addition, unused or over-sprayed powder can be recovered and reused so any waste is minimal and can be disposed of easily and safely.

### Attributes of Powder Coating

- Tough and durable
- Excellent corrosion resistance
- Impact resistant
- Wide range of colours
- Excellent finish
- Versatile
- Solvent free and environmentally friendly
- Applied under controlled factory conditions

There are many advantages that make the choice of applying thermosetting powder coatings attractive to the coating company:

- Powder is immediately ready for use
- Less powder wastage during the application process
- Reduced health hazard to the operators during coating
- Excellent cured-film properties
- Low capital investment costs

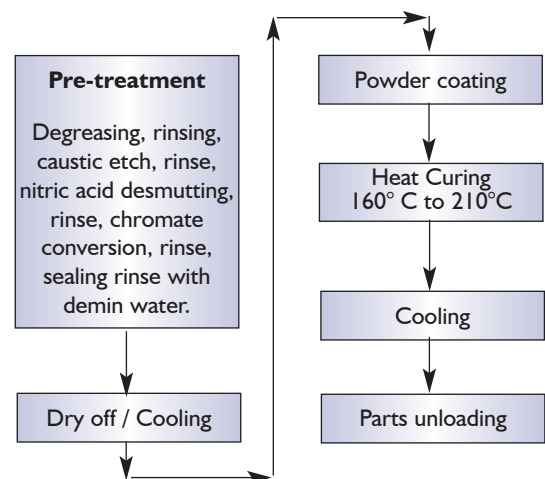
## Powder Coating Process

Correct cleaning and conversion coating are essential to prepare the metal surface for powder coating. Use of a Powder Coater (Applicator), certified to SANS 1796:2010 is strongly recommended to ensure the effective adhesion and optimum appearance of the powder-coat.

The key steps are:

- Degreasing in specially formulated cleaners.
- Rinsing in clean, cascading rinses after all chemical stages.
- Etching in suitable, proprietary solutions, based on caustic soda, at controlled time and temperature.
- De-smutting in formulated solutions of nitric or sulphuric acids.
- Chromate Conversion Coating (or technically equivalent alternatives) to ensure complete adhesion of the Powder coating.
- Final rinsing. Final rinse must use de-ionised water and be done after the conversion coat.
- Process controls and tests to meet SANS 1796 criteria.

Figure 2: Typical Architectural Powder Coating Process Flow Chart



The objectives of pre-treatment of metal surfaces are:

- Removal of impurities including soil, welding splatter, scale, grease and oil.
- Conditioning of the surface for optimum adhesion of the coating film.
- Obtaining uniformity throughout the entire treated surface of the substrate.

It cannot be over emphasised that without full compliance with the above treatments, the powder-coating system will not achieve its proven potential of a long service life and continued attractive appearance.

After pre-treating the aluminium components are loaded onto a conveyor. The first stage in the coating process is powder application. As the components pass through the spray booth the process of coating commences. The powder particles are electrically charged as they pass through specially designed electrostatic spray guns. These particles are attracted to the aluminium components which are earthed. Any over-sprayed powder is recycled and reused. The components proceed through an oven where the metal is heated to 180 to 200°C. The heat melts the powder to create a continuous, uniform film, and causes the powder to cure. The articles are allowed to cool to room temperature, ready for packing for dispatch. The powder coating process is very short.

**NOTE:** The curing temperature of 180 to 200°C requires that there are no heat sensitive items in the components, or any sealed sections.



## Certification and Choice of Powder-Coated Finish

Three different certification schemes are in use in South Africa. The Specifier should select a finish appropriate to the local conditions and the required service life, and ensure that the applicator is approved.

### A. SANS 1796

"Application of Durable Organic Powder Coatings for Architectural Aluminium". (This is a South African specification based on South African and international experience.) Establish the current version of this specification. The 2010 edition is based on a standard polyester powder coat of 60 - 80 microns, offering a life expectancy of 10 to 15 years. It is suitable for all the Corrosivity Areas C1 to C4 inclusive in Table 4.

The Standard recognises options for a longer life and use in more aggressive environments. The standard recommends that for C5 and above one of the following is done prior to the application of the polyester powder:

- Use of an additional 50 micron layer of epoxy powder under the polyester top-coat, resulting in a minimum combined thickness of 110 micron.
- A 5 to 8 micron unsealed anodised base treatment prior to powder coating. This is recognised in SANS 1796 and the Qualicoat system, as an alternative pre-treatment.

**Note:** This is not a normal anodic film. The paint should be applied to the acid rinsed surface within 16 hours. A "sealed" surface or one which could have "self-sealed" over a longer time should never be used. Specific anodising conditions can be found in the Qualicoat Specification for Powder Coatings on Aluminium for Architectural Purposes, Section 3.2.3.

- Note:**
- Although the 2010 edition of SANS 1796 recognises only the standard durability polyester system, it is under review to include the Super-Durable polymers.
  - When specifying that the material must be coated to SANS 1796 it should be noted that only a powder which is certified to SANS 1578: ORGANIC POWDER COATINGS for EXTERNAL ARCHITECTURAL ALUMINIUM should be used.
  - For interior applications only, a similar specification SANS 1274 - can be used.
  - Many ASFA members are certified to supply to the SANS 1796 and SANS 1274 Standards.

### B. QUALICOAT

This is an international quality label organisation committed to maintaining and promoting the quality of coatings used for architectural applications. It recognises three Classes of powder coatings for such purposes:

#### ● CLASS 1

A standard polyester finish, equivalent to the 60 micron finish of

SANS 1796, and is likewise suitable for a 10 to 15 years life expectation.

#### ● CLASS 2

A "super-durable" development of a polyester type with a life expectation of 15 to 25 years (dependent to some extent on the environment). This type is being increasingly used internationally and in South Africa. It is typically used as a single coat system of 60 micron (min) film thickness, but can also be used with an additional under-coat. It is then suitable for all Corrosivity Areas up to C5 and above or where a longer service life is warranted.

#### ● CLASS 3

A fluorocarbon finish, often called a "Hyper-Durable" type, with a life expectation of 25 years or more. This is at least a two coat system, giving a minimum film thickness of 110 micron. The higher costs of Class 3 finishes tend to limit their use to very long life, prestigious applications.

Some ASFA members are approved and certified to supply to the Qualicoat system.

### C. APPROVED APPLICATOR CERTIFICATION

The major powder manufacturers have 'Approved Applicator' Schemes where they offer a performance guarantee when their powder is used. These applicators are normally either SANS 1796 or Qualicoat accredited. Such powder suppliers are certified either to:

#### **SANS 1578: "Organic Powder Coatings for External Architectural Aluminium"**

This will give a finish equivalent to SANS 1796 or the Qualicoat Class 1 finishes.

OR

They can be accredited by a recognised international organisation for the super-durable polyester or fluorocarbon powder-coat finishes.

**Note:** Under an Approved Applicator system, the powder supplied is of a certified quality. The supplier provides and monitors appropriate manufacturing practices and quality control systems and provides the guarantee.

Some ASFA members are qualified to supply certified powder coat finishes under the Approved Applicator Schemes.

### GENERAL

There are therefore a number of options for the Specifier to select accredited coatings and suppliers to ensure a satisfactory and appropriate performance.

For longer service life and more corrosive applications, the Specifier is advised to contact an ASFA Powder Applicator (or powder supplier) for a specific recommendation. In all cases, only SANS 1796 or Qualicoat certified suppliers and recognised Approved Applicators should be used. Powder which is certified to SANS 1578 or with an international accreditation must be used to ensure protection of the substrate against corrosion and to resist degradation of the coating.

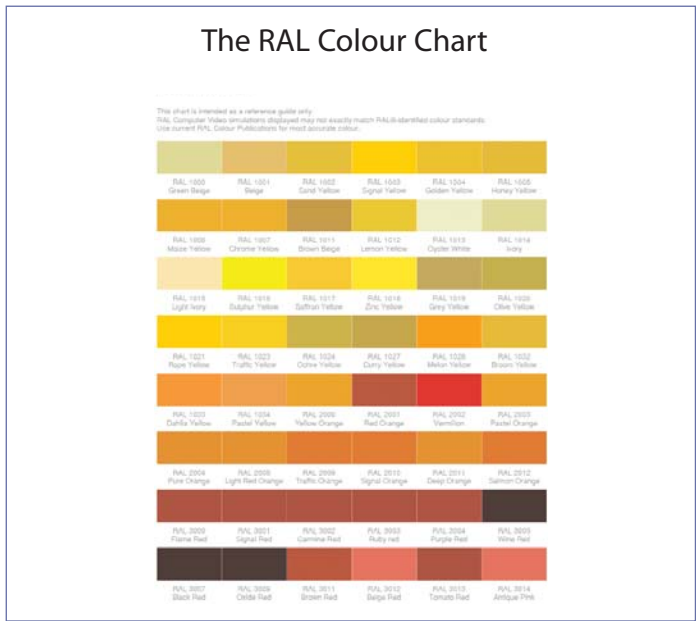
## Range of Colours

Polyester powder coatings are available in a vast range of colours. These may be specified from the international RAL colour chart, SANS 1091 or the individual colour ranges of powder manufacturers and coaters. Specifiers should also specify the gloss level required, with a matt surface being preferable for most architectural finishes as it shows up scratches less. Wood effect finishes can also be provided.



These can be achieved using variety of methods. In the case of sublimation transfer the quality of the inks used should be checked for suitability for exterior use.

Powder coated surfaces are more resistant to chipping, scratching, fading and wearing than other finishes. Colour selection is virtually unlimited with high and low gloss, metallic and clear finishes available. Colours stay bright and vibrant. Texture selections range from smooth surfaces to a wrinkled or matt finish and rough textures designed for hiding surface imperfections. Powder coating is a technology of the future!



## Suitable Substrates for Powder Coating

Mill finish extrusions and sheet can normally be powder coated. However, while they have excellent flow properties, powders will only partially smooth out imperfections in a metal substrate. It is essential that components are supplied in a raw state, with a surface condition that reflects the ultimate surface required. Powder coating can be applied to all of the aluminium extrusion and sheet alloys for decorative or protective purposes. Typical alloys used for powder coating are:

- Extrusions of the 6xxx alloy series, of which 6063 and 6060 are commonest for general architectural purposes. 6005, 6061 and 6082 could be used where higher strength is required.



- Sheet and Coil in the 1xxx, 3xxx and 5xxx series are potentially suitable.
- Aluminium casting alloys can be powder coated - however, the final finish will be dependent on the quality of the casting. A highly porous casting will lead to bubbles in the coating due to out-gassing. Also care must be taken in the choice of alloy for use in corrosive environments to prevent premature failure of the item and loss of coating adhesion. Casting alloys containing over 0,40% copper may not be suitable.

**Note:** Previously anodised and sealed material is not suitable for powder coating as adhesion problems can occur.

## Working with your Powder-coater

The selection of Powder-Coaters who meet the following criteria, are recommended:

- ASFA member companies.
- Applicators certified to supply, as required, to SANS 1796 (exterior) or SANS 1274 (interior) or to Qualicoat Class 1 or Class 11 finishes.
- Users of powder which is certified to SANS 1578.

Apart from the specification of the coating in terms (above) of polymer type, film thickness, colour and gloss, the following aspects should be noted and discussed with the Applicator, if necessary:

### I. Significant Surfaces

Such surfaces including those for flush glazing and any unseen areas should be identified.

### II. Exposed Surfaces

All drawings should indicate any exposed surfaces.

### III. Corrosivity of the Location (corrosion category and/or location)

Will help optimise the coating specification and performance.

### IV. Jigging Points

To apply polyester powder it is necessary to hang each item onto a conveyor and so one or more jigging points are required. These are best in the form of drilled holes or suitable jigging edges, where the contact point does not affect the appearance of the finished product.

V. Pre-treatment Drainage

All of the approved pre-treatments require immersion in aqueous solutions. It is therefore necessary that components do not float or retain trapped solutions after treatment. Hollow components may cause ingress of solutions that can boil out during the powder curing cycle, spoiling the coating.

Most components can be suitably ventilated by a 6 mm diameter hole at a point permitting total drainage of the components.

Large flat butting surfaces can trap solutions by capillary action which should be avoided. Sound deadening or porous filling materials that can absorb pre-treatment chemicals or materials likely to melt below 180°C should not be built into an assembly before coating.

VI. Powder (uneven surface) Penetration

Powder initially adheres during coating by electrostatic forces, but a phenomenon known as "Faraday Cage" can counter the action on components with narrow recesses, slots or sharp, enclosed corners. Advice should be sought where these can be avoided, but in the case of slots, the width between the two edges should be greater than the depth.

VII. Dissimilar Metals

Assemblies consisting of different metals or painted surfaces should be avoided. The different materials may require non-compatible pre-treatments and electrolytic corrosion may be encouraged. The coating of previously painted or sealed anodised metal is not recommended, but it may be feasible at some risk to the appearance.

VIII. Heavy Masses

Heavy components require a longer heating cycle due to the metal temperature being the important criterion. Consequently, these are more expensive to coat. The surface appearance and colour of the finished item may be slightly different between substrates of differing mass due to variations in "heat-up" and "cool-down" times.

IX. Protective Tape

Though polyester powder is an extremely tough and resilient coating, mechanical abuse can cause unsightly scratches and blemishes. Obviously the best way to eliminate this is by adopting good working practices, both during fabrication, and installation. Notwithstanding this, protective tape is used extensively for the protection of architectural products. Only low tack tape should be used as the solvents in the adhesive can attack the coating. Prior to applying tape to the complete job it should be checked for compatibility with the coating.

X. Application

Protective tape is normally applied by the fabricator or window manufacturer. The powder surface to which it is applied must be free from dirt, oil, cement or other surface contaminants. If necessary, the surfaces can be cleaned using a soft cloth dampened in white spirit. The surface must be dry before tape application. The tape used must be low tack and must not attack the powder.

XI. Cleaning of Residual Adhesive

Where necessary, any residual adhesive left on the powder coated surface following the removal of protection tapes should be removed by wiping with a white spirit dampened cloth. Solvents or cleaning solutions containing esters, ketones, chlorinated hydrocarbons or alcohols must not be used. It is always recommended to try these procedures on a small area first.

XII. Packaging and Transport

Aluminium must be packed with care during transport to avoid scratching and marking.

HOW TO SPECIFY. Quality standards and Specifications

What factors should be addressed and clearly defined when specifying architectural aluminium finishes? The importance of clear technical specifications cannot be emphasised sufficiently, a professional reputation may be at stake and costly disputes could arise.

- Select from approved material suppliers and powder coaters, certified to SANS 1578, 1796 or 1274 (interior only) specifications, or with Qualicoat certification or with Approved Applicator qualification.

This will ensure effective control of the powder used, pre-treatment and powder coating processes and testing and quality control of the process and finished products. Full records will be maintained for operational controls, such as chemical analyses of the pre-treatment and product tests e.g. adhesion, film thickness, permeability, appearance etc.

- Specifications should refer to SANS 1578, 1796 (exterior) or 1274 (interior) or Qualicoat (Classes 1, 2 or 3) or membership of an Approved Applicator Scheme and indicate the following:

Certification of Powder

Powder used to be in accordance with SANS 1578 or an internationally recognised certification of durable organic powder for coating of external architectural aluminium. Powder could be Standard Polyester, Super-Durable Polyester or Fluorocarbon.

Powder Coater

Must be one of the following:

- Mark-holder of SANS 1796 for Standard Polyester finishes.
- Certified under Qualicoat Scheme for Standard Polyester (Class 1), Super-durable Polyester (Class 2) finishes. Fluorocarbon (Class 3) subject to enquiry.
- Member of an Approved Applicator Scheme, administered by a major Powder Supplier which complies with the Powder Certification Scheme above for standard and super-durable polyesters.

**NOTE:** Clarification should be sought from the Applicator selected on their accreditation and any guarantees which may be available.

Colour	RAL/NCS
or	SANS
or	Manufacturers range
Finish	Gloss
or	Satin
or	Matt

Powder Coating Film Thickness

60 - 80µ for single coat or 110 µ for 2 coat types.

Protective Coating during installation

Low tack adhesive tape

## Introduction

Although sheet components can be powder coated or anodized, most aluminium sheet, which requires a durable coloured finish, is coated in the coil form, on a continuous coil-coating line. This technology started in the USA, on steel coil in the 1940's, and aluminium lines existed in the USA and Europe by the early 1960's. A modern facility was established in 1993 as part of the extensive sheet and coil semi-fabricating facilities of Hulamin in Pietermaritzburg, Kwazulu Natal. This line is used for sheet and coil for architectural and packaging applications.

## Attributes of Coil (Wet) Coating

Aluminium sheet, (when coated in a continuous coil coating operation), offers significant benefits to the user:

- A uniformly applied chemical pre-treatment ensuring optimal paint adhesion for the service life of the sheet enhance the excellent corrosion resistant properties of the aluminium substrate and the chemically stable characteristics of the paint coating.
- A range of architectural colours and finishes suitable for a long service life and capable of being formed, profiled or laminated into a range of architectural and building products.
- Optimal use of solvent bearing paint in a manufacturing environment designed and operated to limit carbon emissions and use all available energy in a responsible and environmentally friendly manner.
- The paint layer is controlled within 0,010mm (+/- 5 micron) and thermally cured to guarantee uniform natural weathering.

## Aluminium Substrate

A number of aluminium substrate alloys can be coated with this technology. In practice, four alloys satisfy the demand for the following:

- Alloy 1050 H42 for applications, where strength is less critical and formability and bendability are required.
- Alloy 3004 H42 and H44 are used for building applications requiring moderate strength and good formability and corrosion resistance e.g. for the roll forming, profiled applications.
- Alloy 9017 H44, H46 and H48 which are similar to 3004 but are manufactured from 100% re-cycled material.
- Alloy 5052 H42 and 5754 H42 for higher strength requirements with good formability and corrosion resistance.

## The Coil Coating Process

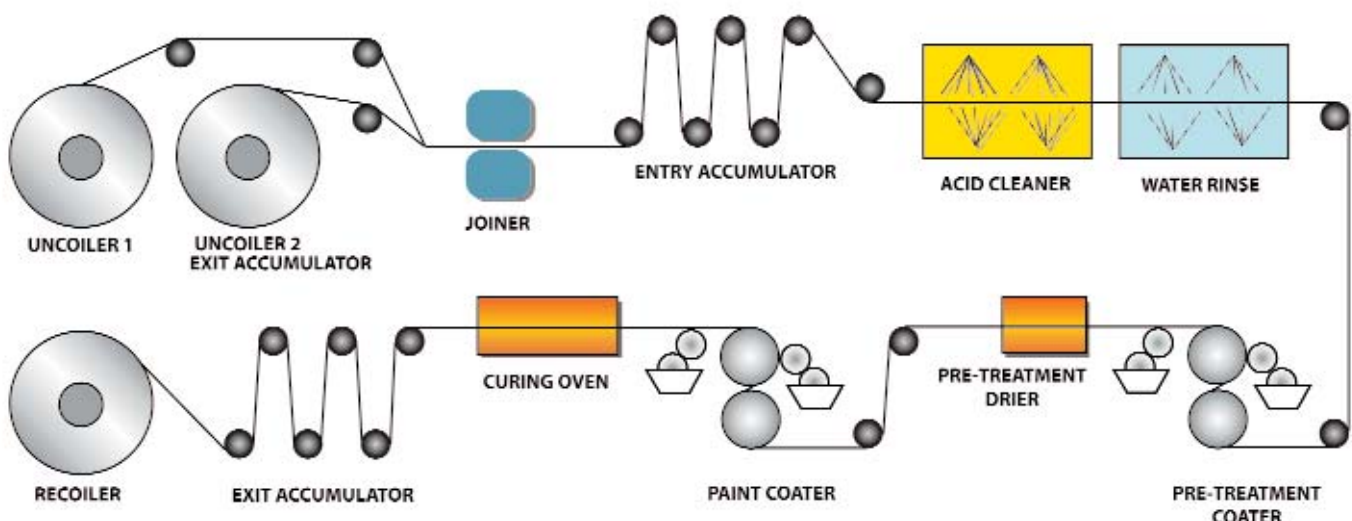
The Coil-Coating Process is shown schematically in the Process Flow Diagram.

The coating line is an integrated, capital intensive, high capacity facility, offering a range of coating types.

The key technical elements are:

- The Cleaning and Pre-Treatment Sections**  
A no-rinse chromate pre-treatment ensures the optimum adhesion, between the aluminium substrate and the organic coatings. The no-rinse technology minimises chromate waste disposal problems experienced with conventional, spray technology.
- Paint**  
A variety of paint types can be applied, although most commonly, for architectural purposes, either polyester or PVDF (polyvinylidene fluoride) are used. The paint system is applied to the pre-treated aluminium surface, in film thicknesses of between 0,020mm (20 micron) and 0,045mm (45 micron).
- Curing**  
The coated strip passes through a 3-zone, gas-fired oven. Temperatures range between 210 to 250° C to evaporate solvents and cure the paint to its final properties and thickness.

Coil Coating Process Flow Diagram





## Products

### i) The Paint System

#### a) Polyester Coating

The polyester coatings are currently the most common and are of the modern "super-durable" formulation for exterior applications. A single coat (18 - 22 microns) is used for rainwater goods and a two coat polyester (total 20 - 26 microns) for awnings, siding and roof sheeting. Service lives of 15 years or more can be achieved.

#### b) PVDF

Alternatively, a number of PVDF finishes are available, typically using a polyester primer of 3 - 5 microns (or 10-12 microns for the lighter colour finishes); under a 20 to 27 micron PVDF finish with proven life cycles of 25 years or more. Metallic coatings are available but usually an additional PVDF barrier coat is recommended to match the corrosion performance of the normal pigmented PVDF. The "PVDF" coating is typically a PVDF/Acrylic blend to recognised international standards.

### ii) Colour and Gloss

The colour is determined in the top-coat, from the use of organic or mineral solid pigments. Titanium, iron, chrome and copper oxides are commonest, although organic pigments can be used. Pigments are available to maintain visual appearance in many colours in a long service-life application. However colour specification should be discussed with the supplier, although colour performance can be quantified, it is very specialised and some colours are less light fast.

### iii) Aluminium Substrate

The substrates are typical of the aluminium work-hardening, rolling alloys, and the temper (dictating strength and formability) is derived from the cold-rolling process. The commonest alloys used are 3004 and 9017 (a proprietary alloy similar to 4017).

### iv) Width and Form

Painted architectural sheet can be supplied in widths up to 1400 mm and either as sheet or coil, suitable for roll-forming etc.

## Standards and Specifications

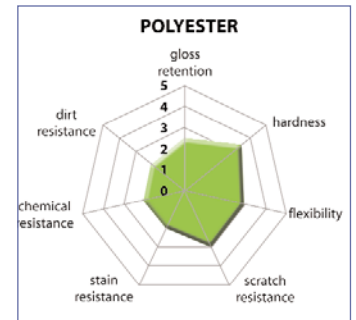
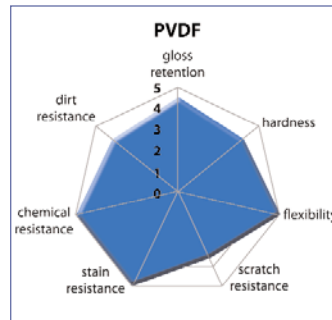
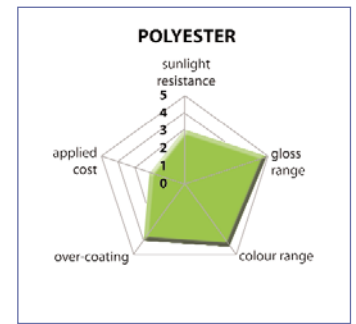
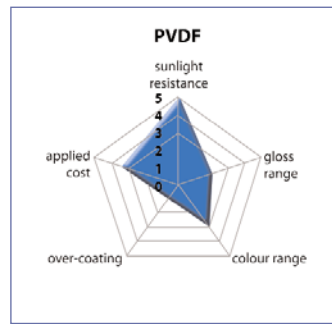
Coil coated products are manufactured to international technical and quality assurance standards.

- Substrates are aluminium alloys to EN573-3. Aluminium and Aluminium Alloys- Chemical Composition and form of wrought products.
- Coating Systems to EN 1396:2007 for Coil Coated Aluminium Sheet and Coil.
- AAMA 620-96: High performance organic coatings on coil coated architectural aluminium substrates.
- Quality Assurance is to SABS ISO 9001:2000.

## Applications

Typical architectural applications for coil-coated sheet are:

- Super Durable Polyesters**  
Roofing and siding, building cladding and accessories, for a typical life cycle of 10 to 15 years and are currently the most common for exterior applications.
- PVDF finishes**  
These are expected to last 20 plus years and are commonly used for roofing and cladding applications, especially where environmental conditions are more demanding such as coastal



and industrial developments where the installation covers a considerable surface area and overall maintenance costs would justify the initially higher investment costs.

- Apartment from the corrosion performance benefits in coastal and industrial uses, some of these applications involve major installations; the use of aluminium allows support structures to be a lighter and more economical weight. Environmental benefits include lower energy consumption and emissivity (which minimises urban "heat-islands").

- The colour selection available in both paint types is extensive and the solar reflectance index, SRI can be an additional criterion in colour and pigment selection, with a "cool colour" reducing the temperature rise and indirectly extending the service life of the paint finish.

## Working with the Coater

In all the above, although certain standard specifications are offered, there is a wide potential permutation of coating, substrates, colours etc. Technical dialogue with the supplier is encouraged to facilitate an optimum product specification in terms of service performance, and initial service costs.

Most of the products from the Coil-Coater are further processed by down-stream facilities into architectural systems for formed roofing and siding, awnings, rain-water goods etc. The final customer or specifier should specify that products are manufactured to the above standards to ensure an optimum performance achievable using modern technology.

RAL 9003 Signal White  
SRI = 80

RAL 9002 Grey White  
SRI = 76

RAL 1015 Light Ivory  
SRI = 67

RAL 9006 White Aluminium  
SRI = 59

RAL 9007 Grey Aluminium  
SRI = 36

## Introduction

As with all materials exposed to the elements, regular maintenance is required to ensure maximum life and performance from the product.

It is in the interests of architects, contractors, owners and building managers to avoid long term damage or deterioration. The factory produced powder or coil coated or anodised finishes cannot be repaired to their original properties by in situ treatments. It is important to:

- Recognise the type of finish to be cleaned.
- Establish a regular cleaning programme to remove dirt, grime, grit, atmospheric pollutants, and iridescence to keep the finish attractive and provide protection. Such cleaning can be carried out at the same time windows are cleaned.

## Cleaning Procedure

There are three distinct categories, namely:

- Primary Cleaning which is the initial cleaning which should occur after installation/completion to remove atmospheric dust, dirt deposits, cement and mortar deposits, adhesives, protective tapes etc.
- Secondary Cleaning which is normally a heavy duty clean on a surface which has not been cleaned for some time. This can be done by companies that specialise in the cleaning of facades, windows, doors, curtain walling etc.

The most important criteria of an aluminium cleaning agent is that it should not be toxic, have a pH between 4, 5 and 9 and it must be free of fluorides, chlorides or sulphates.

- Regular Cleaning is the cleaning cycle which should be done on the finished aluminium after primary or secondary cleaning and, during the service life of the building. The intervals for each cleaning cycle are dependent on the atmospheric pollutants and local climatic and corrosive conditions. Typically approximately three months at the coast and six to twelve months inland."



## Guide Lines for the Protection of Aluminium

### DO'S:

- Protect exposed aluminium surfaces until all the trades etc. have been completed.
- Any cement or acid should be removed as soon as practical. This will prevent any chemical attack.
- When cleaning, wash down all surfaces with a mild neutral detergent and rinse thoroughly.
- Remove stubborn deposits on ANODISED aluminium with a suitable nylon abrasive cleaning pad or brush, plus neutral detergent and then rinse.
- Remove stubborn deposits on POWDER COATED aluminium with a suitable soft cloth or nylon brush, plus a mild neutral detergent and then rinse.
- To clean long neglected areas, it is advisable to use proprietary cleaners specifically formulated for aluminium surfaces. These products contain residual waxes etc. and can substantially improve the appearance of worn or weathered surfaces.
- Test any proposed cleaning technique on a small area first.

### DONT'S:

- Don't use wire brushes, steel wool, blades or emery paper. These are NOT recommended under any circumstances.
- Avoid mechanical damage from scaffolding and bad handling.
- Don't allow cleaning with pool acid on anodised finishes (as it contains chlorides).
- Don't allow cleaning with abrasive pads on powder coated surfaces.
- Don't allow mortar cleaning chemicals to come into contact with powder coated and/or anodised surfaces, unless the cleaning company gives a warranty for its product.
- Aluminium should not be in direct contact with brass or copper, which may be wetted.
- Don't allow strong alkalis such as caustic soda, lime etc. to come into contact with aluminium or finished aluminium.

More detailed information is given in the SANS 10322 Standard for Surface Finishing of Architectural Aluminium. Advice on the protection of aluminium surface finishes during manufacture, transport, coating and installation can also be obtained from AFSA or any accredited surface coating company.



## AFSA AND ASFA MEMBER COMPANIES

Associated with the surface finishing of aluminium for the architectural market and who are available for the supply of products, services and/or information

AFSA and ASFA can be contacted for technical support on:  
Tel +27 11 455 5553 email: [afsa@afsa.org.za](mailto:afsa@afsa.org.za) Website: [www.afsa.org.za](http://www.afsa.org.za)

### ANODISERS

#### Alu Anodisers

Tel: 011 452 8135 Fax: 011 452 8132  
[www.astroholdings.co.za](http://www.astroholdings.co.za)

#### Cape Anodising (Pty) Ltd

**SANS??**

Tel: 021 905 1244 Fax: 021 905 3333

#### Hulamin Anodising (C T)

Tel: 021 507 9100 Fax: 021 534 2469  
[www.hulaminextrusions.co.za](http://www.hulaminextrusions.co.za)

#### Astro Anodising

Tel: 011 452 9748 Fax: 011 452 8132  
[www.astroholdings.co.za](http://www.astroholdings.co.za)

#### Continental Anodisers

SANS 999  
Tel: 011 392 1065 Fax: 011 392 2321

#### Hulamin Extrusions (Pmb)

SANS 999 & ISO 9001  
Tel: 033 395 6911 Fax: 033 342 7811  
[www.hulaminextrusions.co.za](http://www.hulaminextrusions.co.za)

#### PSA Finishers

**SANS?**

Tel: 021 534 2255 Fax: 021 534 2299  
[www.psafinishers.co.za](http://www.psafinishers.co.za)

#### Star Anodising

SANS 999  
Tel: 031 468 6345 Fax: 031 468 8353

#### Wispeco Anodising

SANS 999 & SANS 1407  
Tel: 011 389 0000 Fax: 011 389 0301  
[www.wispeco.com](http://www.wispeco.com)

#### Wispeco Anodising (CT)

SANS 999 & SANS 1407  
Tel: 021 797 8114 Fax: 021 761 7639  
[www.wispeco.com](http://www.wispeco.com)

### POWDER COATERS

#### Cape Anodising (Pty) Ltd

**SANS??**

Tel: 021 905 1244 Fax: 021 905 3333

#### Diri Aluminium Systems (Pta)

SANS 1796  
Tel: 012 666 9022 Fax: 012 666 8146

#### PSA Finishers

**SANS?**

Tel: 021 534 2255 Fax: 021 534 2299  
[www.psafinishers.co.za](http://www.psafinishers.co.za)

#### Polynam

SANS 1796 & SANS 1274  
Tel: 011 618 1055 Fax: 011 614 8536  
[www.polynam.co.za](http://www.polynam.co.za)

#### Wispeco Powder Coating

SANS 1796  
Tel: 011 389 0000 Fax: 011 389 0301  
[www.wispeco.com](http://www.wispeco.com)

#### Wispeco Powder Coating (CT)

SANS 1796  
Tel: 021 959 5400 Fax: 021 951 8725  
[www.wispeco.com](http://www.wispeco.com)

### COIL COATER

#### Hulamin Rolled Products

AAMA 620:96  
Tel: 033 395 6911 Fax: 033 342 8707  
[www.hulaminrolledproducts.co.za](http://www.hulaminrolledproducts.co.za)

### SUPPLIERS

#### Akzo Nobel Powder Coatings SA

Tel: 011 861 0545 Fax: 011 907 2316  
[www.akzonobel.com/powder](http://www.akzonobel.com/powder)

#### Chemetall

Tel: 011 914 2500 Fax: 011 914 4792

#### Chemserve Systems

Tel: 011 457 2400 Fax: 011 457 2401  
[www.chemsystems.co.za](http://www.chemsystems.co.za)

#### E S Mowat & Sons

Tel: 011 493 8223 Fax: 011 493 0248  
[www.esmowat.co.za](http://www.esmowat.co.za)

#### Ferro Industrial Products

SANS 1578, ISO 9001 & ISO 14001  
Tel: 011 746 4000 Fax: 011 746 4022  
[www.ferrosa.co.za](http://www.ferrosa.co.za)

#### Powder-Lak

Tel: 011 437 5905 Fax: 011 437 5907  
[www.powderlak.co.za](http://www.powderlak.co.za)

#### Surface Treatment Technologies

Tel: 011 626 1452 Fax: 011 626 2258

#### Surtec

Tel: 012 345 2215 Fax: 012 345 3731



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Tel +27 11 455 5553  
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[www.afsa.org.za](http://www.afsa.org.za)



All illustrations used in this Guide are of South African produced materials and surface finishes.