



HULAMIN

PAINTED ALUMINIUM ROOFING

INTRODUCTION

Hulamin is a leading, mid-stream aluminium semi-fabricator of aluminium products located in Pietermaritzburg, KwaZulu-Natal and Midrand, Gauteng, supported by sales offices in South Africa, Europe and the USA.

WHY ALUMINIUM

Each of our businesses shares a passion for aluminium – a unique metal with a superior range of benefits & properties and endless application possibilities. Aluminium is the preferred material of choice for buildings worldwide and has many advantages for building designers.

BENEFITS OF ALUMINIUM ROOFING

Lightweight: Aluminium has a high strength-to-weight ratio which offers building designers major cantilevers and open span structures.

Formability: Aluminium is readily formable by bending, roll forming, deep drawing, sawing, drilling, machining, polishing, pressing, extruded, forging, die casting, and metal ironing.

Durability: Durability of building materials is affected by many factors and amongst these factors is distance from the sea, local air pollution, sand, and ultraviolet light. Aluminium is resistant to atmospheric and chemical attack and hence offers long life expectancy.

Aesthetics: Aluminium retains its aesthetic appearance for a long term due to self-healing film of oxide which forms immediately on contact with air and water.

Low melting temperature: Aluminium has a low melting point when compared to substitute materials like steel. In the event of fire, instead of fire being trapped, heating up and collapsing the entire structure, the aluminium skin of the building melts above the fire causing the fire to vent and releasing the heat to the atmosphere reducing the propensity of the fire to spread throughout the building and thus saving the rest of the structural members. Aluminium is non-combustible and non-flammable.

EFFICIENT GREEN BUILDING

High reflectivity and low emissivity: The energy efficiency of a building is an important factor in its environmental impact and aluminium is renowned for its thermal properties. The high reflectivity of aluminium, especially mill finish, prevents heat loss from a building and low emissivity greatly reduces heat gain in a building. The heat load in summer is reduced and air-conditioning requirements are less.

Recyclable: The basis of aluminium's significant environmentally friendly attributes lies in its energy effectiveness. Aluminium is recyclable and can be used again and again without quality degradation. Only 5% of the energy required to manufacture the original aluminium material is needed for recycling.

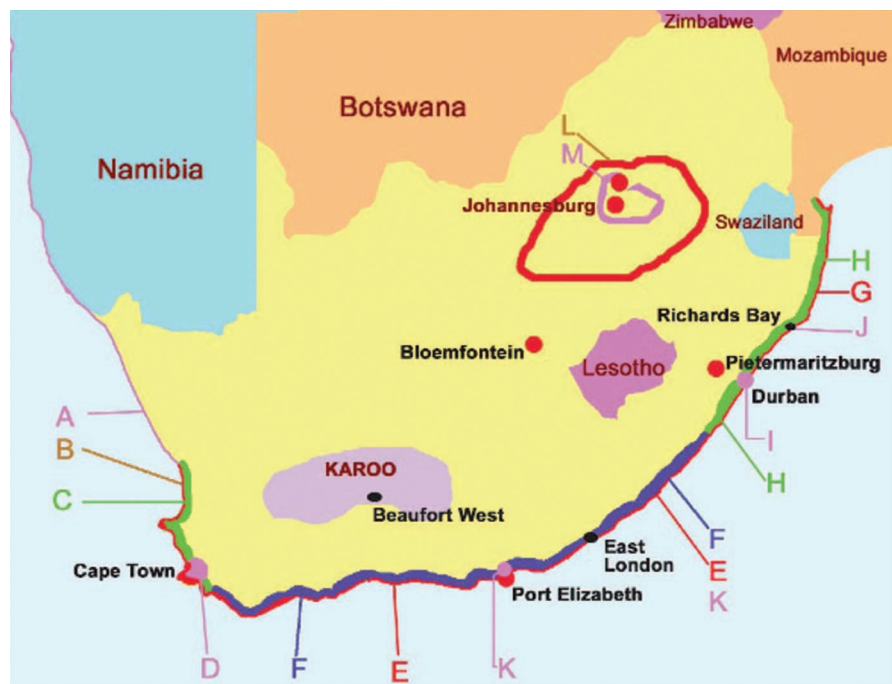
Low Modulus of Elasticity: Aluminium's strength combined with a low modulus of elasticity means that aluminium will deflect three times deeper than steel and still return to its original shape. In cases where hail is common, embossed sheet is recommended.

Economic Advantage: The economic advantage of aluminium with its unlimited life, far outweigh those of almost all other materials. Combined with its durability, life cycle costs have proven aluminium to be a winner.



Hulamin Rolling Mill Factory, Pietermaritzburg

ATMOSPHERIC CORROSION IN SOUTH AFRICA



Aluminium is best suited for use in regions of high atmospheric corrosion because the hard inert oxide film that forms instantaneously when cut or abraded inhibits corrosion.

The key factors in the atmospheric corrosion of metals and alloys is categorised based on the constituents of the atmosphere, and in particular the levels of corrosivity and sulphur dioxide present, together with the time-of-wetness of metal surfaces.

This map and the following table, courtesy of Aluminium Federation of South Africa, indicates the corrosivity areas derived for Southern Africa with the associated ISO corrosivity ratings.

THE TABLE, COURTESY OF AFSA, INDICATES THE CORROSIVITY AREAS DERIVED FOR SOUTHERN AFRICA WITH THE ASSOCIATED ISO CORROSIVITY RATINGS.

CODE	GEOGRAPHIC AREA	DISTANCE FROM OCEAN	DESCRIPTION	ISO 9223 CATEGORY	COMMENTS
A	Namibia & NW Cape shore-line	To 5 km	Desert shore-line and coastal fog zone	C5 Very high	North of Olifants River
B	W. Cape Atlantic shore-line	To 3 km	Arid shore-line with fog or strong winds	C5 Very high	False Bay to Olifants River
C	W. Cape coastal	To 5-15 km	Coastal area	C4 High	To range of fall-out of salt aerosols
D	W. Cape urban	To 25 km	Coastal urban/industrial	C5 Very high	Cape Town and surrounds
E	S. & E. Cape shore-line	To 1 km	Temperate shore-line	C5 Very high	Distance from ocean varies with terrain
F	S. and E. Cape & Natal south coastal	To 5-10 km	Temperate coastal	C4 High	Distance from ocean varies with terrain
G	KZN shore-line	To 4 km	Subtropical shore-line	C5 Very high	KZN to Maputo
H	KZN coastal	To 15-25 km	Sub-tropical coastal	C4 High	
I	Durban urban	To 10 km	Urban & industrial, inland of shore-line	C5 Very high	Amanzimtoti to Durban North
J	Richards Bay	To 15 km	Urban & industrial, inland of shore-line	C5 Very high	
K	Coastal cities	To 10-15 km	Industrial & heavy traffic areas	C5 Very high	Areas of Port Elizabeth, East London, Pinetown
L	Highveld general area	-	Rural & suburban areas	C3 Medium	
M	Highveld urban & industrial	-	High-traffic urban, or close to heavy industry	C4 High	East Rand, areas of Pretoria, Witbank

The remainder of the region is categorised as C3, low and very low: C2 to lower C3 depending on climate.

ATMOSPHERIC CORROSION IN SOUTH AFRICA COMPARING PERFORMANCE OF ALUMINIUM VS GALVANISED STEEL SHEETING

DESCRIPTION	TYPE OF CORROSION	MILD STEEL* CORROSION RATE μM/YR	GALVANISED STEEL SHEET** LIFE IN YEARS^	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.

^Life in years - until 5% of surface area showing red rust.

**Commercial grade Z 275g/m2 (unpainted).

++Industrial implies pollution present in atmosphere.

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

ALUMINIUM ROOFING PAINTED PRODUCT SPECIFICATIONS

End-user applications for Painted products are currently available in the following alloys and tempers and are subject to minimum order quantity.

ALLOY	TEMPER	GAUGE (mm)	WIDTH (mm)	END-USER APPLICATIONS
3004	H42, H44, H46	0.50 – 1.00	1400 max	Roofing and wall cladding Rain water goods Pipe cladding Awnings Garage Doors
9017	H44, H46, H48	0.35 – 1.00	1400 max	Roofing and wall cladding Rain water goods



Aluminium Roofing - Port Elizabeth Boardwalk

PAINT SYSTEMS

Hulamin offers two paint technologies namely Polyvinylidene Fluoride (PVDF) and Polyester G4 branded as:

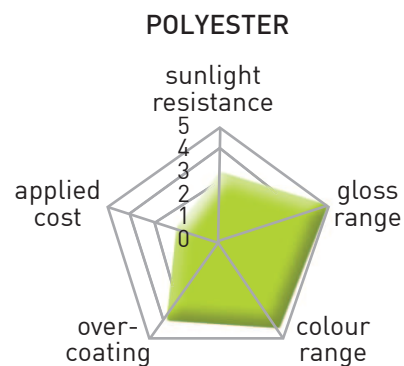
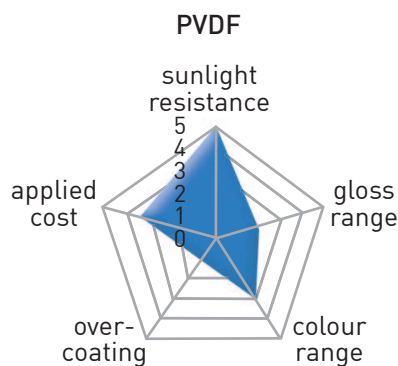
color tech (PVDF) and **color tech** (POLYESTER G4)

Selecting a paint system is dependent on the balance between performance requirements and cost.

Some criteria to consider when choosing between polyester and PVDF include:

- Expected life cycle, i.e. 10, 15, 20 or >25 years, more specifically the desired resistance to sunlight exposure and its detrimental impact
- Desired surface appearance, (i.e. matt or glossy)
- Colour availability and preference
- Possible future need to re-image the structure by over-coating

A comparison between these two paint systems can be represented graphically as follows, with 5 designating best or most suited performance:



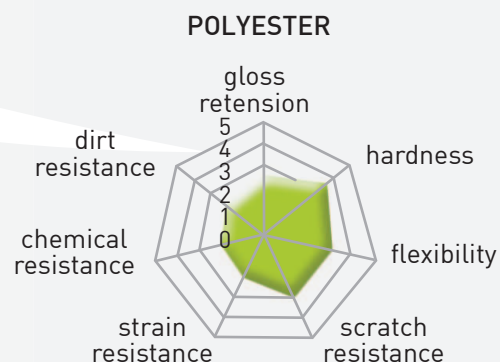
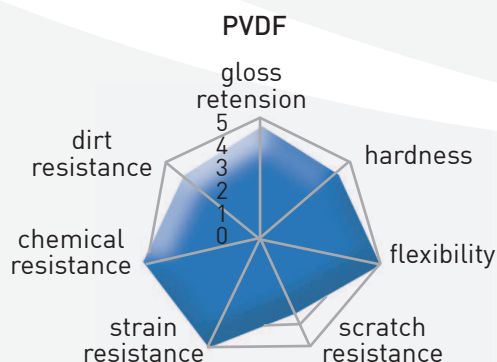
Lifespan or durability requires further consideration of the micro-environment conditions, specifically:

- Ultra violet radiation levels (sunlight) of exposed surface
- Dirt pick-up as a result of environmental pollution
- Presence of aggressive chemicals
- Exposure to excessive localized heat sources

The structural design of roofing, cladding, rain water applications and awnings play an additional role and considerations should include:

- The presence of wind-blown sand
- Structural design to assist natural cleaning as a result of rain water run-off

A more detailed comparison of specific performance behaviours between PVDF and Polyester paint systems can be represented graphically as follows, with 5 designating best or most suited performance:



PAINTED PRODUCTS CHARACTERISTICS, USES AND GUARANTEES

	PVDF	POLYESTER G4
Product Characteristics	Extended Life Cycle (20+ years) Best UV resistance Excellent* outdoor durability Excellent flexibility Excellent* chemical resistance *Metallic pigmented system requires clear coat	Medium Life Cycle (10-15 years) Excellent surface hardness Excellent flexibility
GUARANTEES – PAINT AND METAL SUBSTRATE		
Guarantees	25 year guarantee on paint. 25 to 30 years on metal substrate	15 year guarantee on paint. 15 to 20 year guarantee on metal substrate
Colour Fading	Maximum loss of 2 ΔE Units	Maximum loss of 4 ΔE units
Chalking	Not worse than a rating 8	Not worse than a rating 6
Film Erosion	2 μ m maximum loss	2 μ m maximum loss
Loss of Gloss	Minimum loss 10%	Minimum remaining 20%

Hulamin offers guarantees of between 15 to 25 years depending on the paint system, colour, and end-user application. A guarantee period does not denote the life-span of the product. In most cases where normal atmospheric conditions persist, the life-span exceeds the guarantee period by more than 10 years. All guarantees are based on metal being used under normal atmospheric conditions and under normal conditions of use. The metal substrate guarantee is against perforation resulting from corrosion under normal conditions of use.



Delhi Airport, India



Jebel Ali Airport, Dubai



King Shaka International Airport, Durban



Beijing Opera House



Laoshan Velodrome, Beijing



Roofing, Southern Cross Station, Melbourne, Australia

STANDARD COLOURS

Hulamin currently offers the standard colour shown in the table below. However, our extensive coating expertise and close working relationship with major coating suppliers make it possible to match a customer's non-standard colour requirements.

Roofing	Rain Water Goods
Marble White	Royal Brown
Charcoal Grey	Charcoal Grey
Sandy Beige	Rich Ivory
Hazy Grey	Anthracite
Forest Green	Forest Green
Azure Blue	Marble White

QUALITY CONTROL

Hulamin's quality control extends into every facet of our operation. Our quality control tests listed in the table below are based on accelerated conditions to simulate the actual field exposure to ensure that coils coated on our line meet the customer's performance criteria.

PROCESS	QUALITY CONTROL
Before Coating	Substrate: chemical, physical and dimensional characteristics Paint: verify colouring, gloss and physical performances
During Coating	Chrome conversion coating film weight Thickness and Gloss of the paint applied Curing temperature
After Coating	Physical appearance Paint Thickness Gloss Colour Hardness Adhesion Flexibility Resistance to rapid deformation
Laboratory	Corrosion resistance – Acetic acid salt spray Ageing – Ultraviolet radiation for pigment colour stability and paint resin resistance Ageing – Outdoor weathering exposure Strain resistance

THINK FUTURE | THINK ALUMINIUM | THINK HULAMIN

Hulamin coil coated products are manufactured to international technical and quality assurance standards, namely:

- EN573-3 Aluminium and Aluminium Alloys, Chemical Composition and Form of Wrought Products
- EN1396:2007 Coil Coated Aluminium Sheet and Coil
- AAMA 620-96 High Performance Organic Coatings on Coil Coated Architectural Aluminium Substrates
- British Board of Agrément (BBA)
- SABS ISO 9001:2008 Quality Assurance

In addition, one of Hulamin's business objectives is to ensure the highest safety and environment standards and to reinforce this commitment it is certified for:

- OHSAS 18001:2007
- ISO 14001:2004 Environmental Management Systems

OFFICES

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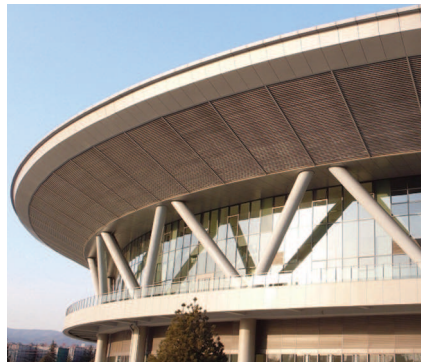
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SOME MAJOR PROJECTS



Qingdao Stadium, Beijing



Laoshan Velodrome, Beijing



Roofing, Southern Cross
Station, Melbourne, Australia



Alu Shade, Nelson Mandela Bay
Stadium, Port Elizabeth



Olympic Velodrome, Athens, Greece



Moses Mabhida Stadium,
Durban