AAF QUEENSLAND

RESEARCH & DATA — 04

TECHNICAL PERFORMANCE & AUSTRALIAN STANDARDS

Understanding the Standards, Testing and Quality Requirements for Architectural Anodising

High-grade architectural anodising is not simply a decorative finish. It is a controlled electrochemical process, supported by technical standards, performance testing and quality assurance, intended to provide durable protection for aluminium in demanding architectural environments.

Introduction — Performance Begins with Specification

Architectural aluminium is widely used in buildings because of its strength, low weight, versatility, corrosion resistance and design flexibility.

However, its long-term appearance and performance depend on several factors, including the aluminium alloy, environmental exposure, finishing process, installation and maintenance.

For architectural anodising, the protective finish is produced by electrochemically transforming the aluminium surface into an integral aluminium oxide layer.

The resulting film can provide excellent corrosion resistance, surface hardness and long-term durability.

But successful performance depends on more than the formation of the oxide layer itself.

The thickness and structure of the anodic film, effectiveness of sealing, suitability of the substrate and consistency of the manufacturing process are all important.

Australian and international standards provide a framework for specifying and verifying these characteristics.

This paper examines the principal standards, technical performance requirements, environmental considerations and testing methods relevant to architectural anodising.

It also introduces the updated Australian Standard AS 3715:2025 for architectural powder coatings, recognising the importance of informed comparison between established finishing systems.

4.1 Australian and International Anodising Standards

Why Standards Matter

Architectural finishing standards establish recognised technical requirements for the manufacture, assessment and specification of finished aluminium.

They assist architects, engineers, suppliers and building owners in defining the performance expected from a finishing system.

For architectural anodising, relevant requirements can include:

- Anodic oxide film thickness.
- Appearance and finish consistency.
- Quality and effectiveness of sealing.
- Corrosion resistance and durability.
- Testing and inspection procedures.
- Selection of suitable aluminium alloys.
- Handling, maintenance and service conditions.

Standards are particularly important for external architectural applications, where components may be expected to perform for many decades under demanding environmental conditions.

Australian Standard AS 1231

AS 1231:2000 — Aluminium and Aluminium Alloys: Anodic Oxidation Coatings

AS 1231 provides the principal Australian reference for conventional protective and decorative anodic oxidation coatings on aluminium.

It includes requirements for general applications and external architectural applications.

The Standard addresses matters such as coating thickness, testing and inspection, together with guidance on selecting suitable aluminium alloys and anodising grades.

It also provides information concerning handling, maintenance and the protection of finished components.

AS 1231 is particularly relevant to architects and specifiers seeking to establish measurable requirements for anodised aluminium.

The specified coating grade should be appropriate to the building's intended application and environmental exposure.

AS 1231:2000 was reconfirmed in 2017. Any subsequent revision or replacement should be checked against the official Standards Australia catalogue before a project specification is finalised.

International Standard ISO 7599

ISO 7599:2018 — Anodizing of Aluminium and Its Alloys: Method for Specifying Decorative and Protective Anodic Oxidation Coatings

ISO 7599 provides an internationally recognised framework for specifying decorative and protective anodised aluminium.

It addresses characteristic properties, minimum performance requirements, testing and the selection of appropriate aluminium materials and surface preparation.

The Standard also recognises the importance of specifying appearance and texture, particularly where consistency is required across architectural components.

ISO 7599 provides a useful technical reference for projects seeking alignment with international architectural anodising practice.

American Architectural Standard AAMA 611

AAMA 611 — Specification for Anodized Architectural Aluminum

AAMA 611 is an important North American architectural anodising specification.

It establishes performance requirements for anodised aluminium used in architectural applications.

The specification distinguishes between architectural Class I and Class II finishes.

In AAMA 611-24, the minimum anodic film thicknesses for the principal exposed surfaces are:

Architectural classification	Minimum anodic film thickness
Class I	18 µm
Class II	10 µm

Class I is generally associated with more demanding architectural exposure and durability requirements, while Class II is used for less demanding applications.

These classifications should not be assumed to correspond directly with Australian thickness grades or individual manufacturers' architectural finishing systems.

International Quality Schemes

In addition to national and international standards, the architectural anodising industry has developed quality assurance schemes such as QUALANOD.

These schemes provide detailed requirements for production control, testing, inspection and quality management.

They can assist in demonstrating consistent process performance, but accreditation or certification should only be claimed where it is current and independently verified.

Applying the Standards

Standards provide important technical foundations, but the correct specification must also consider the intended use of the aluminium.

A suitable architectural anodising specification should identify the relevant standard, required film thickness, appearance, acceptable colour variation, sealing requirements and inspection arrangements.

Where particularly demanding exposure conditions apply, additional project-specific requirements may be necessary.

The purpose of architectural standards is not simply to achieve a specified thickness, but to establish a measurable and consistent level of finishing performance.

4.2 Anodic Film Thickness, Sealing and Quality Control

The Anodic Film — An Integral Protective Surface

Anodising converts the aluminium surface into a controlled aluminium oxide layer.

The thickness, structure and condition of this layer influence its protective and decorative characteristics.

Anodic thickness is measured in micrometres, commonly referred to as microns or µm.

One micrometre is one-thousandth of a millimetre.

Architectural specifications may nominate nominal thicknesses such as 15, 20 or 25 μm, depending on the applicable standard, intended application and environmental conditions.

However, film thickness alone does not determine performance.

Why Thickness Matters

The anodic oxide layer provides a protective barrier that can improve the aluminium's resistance to environmental attack.

For external architectural applications, sufficient film thickness is important in achieving the required durability.

Greater thickness may improve resistance under particular conditions, but it must be developed through an appropriately controlled process.

An excessively simplified specification based only on nominal thickness can overlook other critical factors.

For example, a coating with adequate thickness but inadequate sealing may not provide the intended resistance to staining or corrosion.

Similarly, a well-sealed anodic film may still be unsuitable where the chosen thickness or aluminium alloy does not meet the application's requirements.

The Importance of Sealing

Conventional sulphuric acid anodising produces an oxide layer containing microscopic pores.

These pores can accommodate colouring processes, but also require suitable treatment to achieve the desired protective characteristics.

Sealing reduces the porosity and absorptive capacity of the anodic surface.

Depending on the process, sealing may involve controlled exposure to hot water, steam, suitable chemical solutions or other approved treatments.

Effective sealing is particularly important for external architectural finishes, where resistance to staining, moisture and environmental contamination is required.

Testing Sealing Quality

International standards provide several methods for assessing sealing effectiveness.

ISO 3210:2025 — Loss of Mass Testing

This standard describes methods for assessing sealing quality by measuring the mass lost after exposure to specified acid solutions.

It includes a method particularly relevant to outdoor architectural anodising.

ISO 2931:2017 — Electrical Admittance Testing

This standard assesses sealing quality by measuring electrical admittance.

It can be useful for production control and acceptance testing where the method is suitable for the coating and sealing process.

Other tests, including dye absorption methods, may also be appropriate for particular anodised finishes.

The applicable method and acceptance criteria should be defined by the specification and recognised standard.

Measuring Anodic Film Thickness

Film thickness can be assessed using calibrated instruments designed for non-destructive coating measurement.

The relevant measurement method, sampling procedure and acceptance criteria should be established before production.

Testing should consider the significant exposed surfaces of the aluminium component, recognising that geometry, contact points and edges may affect measured thickness.

Production Process Control

High-grade architectural anodising depends on consistent control throughout the manufacturing process.

Important considerations include:

Aluminium alloy selection

The chemical composition and manufacturing history of the aluminium can affect anodising behaviour, colour and appearance.

Surface preparation

Chemical etching, mechanical finishing and cleaning influence the appearance and quality of the finished surface.

Electrochemical processing

Current density, electrolyte concentration, temperature and processing time require careful control to develop the specified anodic film.

Colouring

Electrolytic or other colouring processes must be controlled to achieve the approved appearance and appropriate colour stability.

Sealing

The final treatment must be appropriate to the anodic film, colour system and intended exposure conditions.

Documented Quality Assurance

A robust quality assurance programme may include:

- Approved production specifications and physical samples.
- Monitoring of bath chemistry and electrical processing conditions.
- Thickness measurements.
- Sealing quality tests.
- Visual inspection and colour comparison.
- Traceable production and test records.
- Appropriate handling and despatch controls.

Independent inspection or certification may be required for particular architectural projects.

AAF Queensland Architectural Hardcoat

AAF Queensland's selected Evershield® Architectural Hardcoat finishes are intended for high-grade architectural applications.

The objective is to provide finishes manufactured under defined processing conditions, supported by appropriate quality verification and project-specific specification requirements.

Architects and fabricators are encouraged to involve AAF Queensland early in the design process so that alloy suitability, finish appearance, anodic thickness and expected environmental exposure can be considered together.

Long-term architectural performance depends on the complete manufacturing process — not on film thickness alone.

4.3 Corrosion Resistance and Environmental Exposure

Understanding the Australian Environment

Australia presents a wide range of conditions affecting architectural materials.

These include dry inland environments, urban pollution, industrial atmospheres, high humidity, intense sunlight and marine exposure.

The environmental conditions surrounding a building can influence the performance of aluminium finishes.

Corrosion protection should therefore be considered in relation to the intended installation location.

Australian Standard AS 4312:2019

AS 4312:2019 — Atmospheric Corrosivity Zones in Australia

This Standard provides guidance for identifying the corrosivity of Australian atmospheric environments.

It establishes categories based on atmospheric corrosion severity.

Category	General description
C1	Very low corrosivity
C2	Low corrosivity
C3	Medium corrosivity
C4	High corrosivity
C5	Very high corrosivity
CX	Extreme corrosivity

These categories are useful in identifying demanding environments and informing protective finishing specifications.

The classification system is based on standardised atmospheric corrosion assessment, including corrosion rates of reference metals.

It is not a direct measurement of expected anodic film loss or a prediction of aluminium component service life.

Coastal and Marine Exposure

Marine environments present particular challenges because airborne salts can accumulate on building surfaces.

Salt deposition, moisture, atmospheric conditions and cleaning frequency all influence the risk of corrosion.

Buildings close to breaking surf may experience significantly more severe exposure than buildings located further inland.

However, distance from the coast alone is not sufficient to determine the appropriate environmental classification.

Other factors include local geography, prevailing winds, sheltering, rainfall, industrial pollution and building geometry.

Queensland and Northern Australia

For Queensland and Northern Australian projects, several environmental factors warrant consideration:

- Coastal salt exposure.
- High humidity.
- Strong ultraviolet radiation.
- Heavy rainfall.
- Temperature variations.
- Industrial and urban contamination.
- Sheltered areas where deposits may accumulate.

These conditions can affect both anodised and powder-coated aluminium, although the mechanisms and visible forms of deterioration differ.

Corrosion Resistance of Anodised Aluminium

Anodising provides corrosion protection by converting the aluminium surface into a controlled oxide layer.

The protective properties depend on the thickness and quality of this layer, effective sealing, the aluminium alloy and the exposure conditions.

Correctly specified architectural anodising can provide excellent long-term performance in coastal environments.

However, anodised aluminium is not completely immune to corrosion.

Damage, unsuitable alloys, severe chemical exposure, salt deposits, crevices or contact with incompatible materials may contribute to deterioration.

Design and Installation Considerations

The performance of the finished aluminium component is influenced by its design and installation.

Important considerations include adequate drainage, avoiding water traps, compatible fasteners and isolation from dissimilar metals where galvanic corrosion may occur.

Cleaning and maintenance should also be appropriate to the environmental exposure.

Regular removal of accumulated salts and contaminants can contribute significantly to long-term appearance and performance.

Choosing the Appropriate Finish

A suitable finishing specification should be developed by considering the atmospheric environment, intended useful life, architectural appearance and required maintenance.

The finish grade should be selected in consultation with the finishing supplier, relevant standards and the project design team.

The correct architectural finish is not determined by colour alone. It must be suited to the environmental conditions in which it will perform.

4.4 Fire Performance — Anodised Aluminium

Understanding the Material Difference

Anodising produces an inorganic aluminium oxide surface rather than applying an organic polymer coating.

Aluminium oxide is a chemically stable ceramic-type material with a very high melting temperature.

This is an important distinction between an anodic finish and an organic architectural coating.

However, the thermal characteristics of the anodised surface must not be confused with the fire resistance of the underlying aluminium or a complete building assembly.

The High-Temperature Characteristics of Aluminium Oxide

Aluminium oxide, commonly known as alumina, has a melting point of approximately 2,050°C, depending on the material form and composition.

This is significantly higher than the melting point of metallic aluminium.

The anodic oxide layer is very thin relative to the aluminium substrate, typically measured in micrometres.

Its high melting temperature does not mean that anodised aluminium components can maintain their structural integrity at comparable temperatures.

Aluminium in Fire Conditions

Aluminium has a melting point of approximately 660°C, depending on the alloy.

Its strength and stiffness also reduce significantly as temperature rises, well before melting occurs.

Consequently, an aluminium facade, window frame or other building component can lose its load-bearing or functional capacity during a fire, regardless of whether its surface has been anodised.

The high-temperature properties of aluminium oxide do not make the underlying aluminium fire-resistant.

Inorganic and Organic Finishes

Anodising differs chemically from powder coating because the anodic surface is predominantly inorganic aluminium oxide.

Architectural powder coatings contain organic polymer materials.

This distinction may be relevant when considering the contribution of finishing materials to combustion, smoke or heat release.

However, the overall fire behaviour of a finished building product depends on its complete construction.

Factors may include the substrate, surface finish, composite cores, insulation, adhesives, fixings, cavities and installation details.

The presence of an inorganic anodised finish does not, by itself, establish a fire classification.

National Construction Code Requirements

Australian building fire requirements are established through the National Construction Code and applicable referenced standards.

Depending on the building and application, assessment may involve:

AS 1530.1 — Combustibility Test for Materials

Used where material combustibility testing is required.

AS 1530.3 — Simultaneous Determination of Ignitability, Flame Propagation, Heat Release and Smoke Release

Relevant to specified fire hazard property assessments.

AS 1530.4 — Fire-Resistance Tests of Elements of Construction

Used to assess the fire resistance of relevant building elements and assemblies.

Other methods and requirements may apply depending on the product and building system.

The applicable NCC edition, referenced standards and acceptable compliance pathway should be confirmed for each project.

Architectural Specification

When considering anodised aluminium for facades, windows, panels and other applications, fire compliance must be assessed for the completed product or assembly.

AAF Queensland can provide information about the characteristics of the anodised finish.

However, project-specific fire compliance and any fire resistance rating must be established through the appropriate product evidence, engineering assessment and building approval process.

Anodising produces an inorganic surface with distinctive thermal characteristics. This should not be represented as a fire resistance rating for the complete aluminium component.

4.5 Architectural Powder Coating Standards — AS 3715:2025

An Important Australian Standard

Powder coating is one of the principal finishing systems used for architectural aluminium.

It offers a very extensive range of colours, textures and decorative effects, supported by established industrial processes.

Different powder coating formulations are available to suit varying performance requirements.

The applicable Australian Standard is:

AS 3715:2025 — Metal Finishing: Thermoset Powder Coatings for Architectural Applications of Aluminium and Aluminium Alloys

Published on 28 February 2025, this edition replaced AS 3715:2002.

The revised Standard provides requirements and testing procedures for factory-applied architectural thermoset powder coatings.

Performance Classifications

The Standard incorporates powder coating performance classifications intended to assist in selecting coatings suitable for different architectural uses and exposure conditions.

Industry guidance describes classifications including:

L1 — Standard durability

Coatings intended for applications appropriate to the lower performance classification, subject to the Standard's selection criteria.

L2 — Higher durability

Coatings providing enhanced architectural performance for applications requiring the corresponding classification.

L3 — Ultra-durable

Higher-performance coatings intended for more demanding durability requirements and environments.

The final specification should use the exact classification terminology and applicable requirements contained in AS 3715:2025.

A coating manufacturer's product name or marketing description should not be treated as a substitute for documented compliance with the specified class.

Environmental Exposure and Coating Selection

An important development in AS 3715:2025 is the closer relationship between powder coating selection, building requirements and atmospheric corrosivity classifications.

Guidance associated with the revised Standard identifies the importance of AS 4312 environmental categories in selecting appropriate coating performance.

This assists specifiers in considering the actual exposure conditions rather than relying only on a general description such as coastal or inland.

Building classification and intended use may also influence the required performance class.

Performance Testing

Architectural powder coating standards address characteristics relevant to long-term performance.

These may include:

- Coating thickness and appearance.
- Adhesion and film integrity.
- Resistance to weathering.
- Colour and gloss retention.
- Corrosion resistance.
- Applicable testing and acceptance procedures.
- Suitability for the specified environment.

Performance depends not only on the powder formulation but also on substrate pretreatment, application, curing and ongoing maintenance.

Warranty and Service Life

Manufacturers' warranties can provide useful guidance about expected coating performance under specified conditions.

However, warranty periods vary according to the coating system, location, exposure, building application and maintenance requirements.

A warranty should not be treated as an automatic prediction of the maximum useful life of the coating.

Similarly, classification under AS 3715:2025 does not establish a universal service life applicable to every building.

Comparing the Standards for Anodising and Powder Coating

Anodising and powder coating are fundamentally different technologies.

Their standards are therefore designed to address the particular characteristics and performance requirements of each system.

Consideration	Architectural anodising	Architectural powder coating

Principal Australian standard	AS 1231	AS 3715:2025
Finish type	Integral aluminium oxide	Applied organic polymer
Important production controls	Anodising conditions, film thickness, colouring and sealing	Pretreatment, film application, thickness and curing
Performance verification	Thickness, sealing, appearance and relevant durability tests	Adhesion, film integrity, appearance, weathering and corrosion tests
Exposure considerations	Alloy, thickness, sealing, environment and maintenance	Coating classification, pretreatment, environment and maintenance
Long-term outcome	Depends on process quality, application and conditions	Depends on coating grade, application and conditions

These requirements provide useful information for architects comparing different finishing options.

Neither finishing technology should be selected solely by nominal thickness or warranty period.

The appropriate specification will depend on the intended architectural appearance, performance requirements, environmental exposure and expected useful life.

The Importance of Informed Choice

AAF Queensland recognises the significant technological progress made by the architectural powder coating industry.

Modern high-performance powder coatings provide valuable options for many architectural applications.

At the same time, anodising offers a fundamentally different method of finishing aluminium, with distinctive material characteristics and documented long-term durability.

Understanding the relevant standards and performance requirements allows architects and specifiers to consider these technologies objectively.

The objective should be to select the finishing system most appropriate to the building, rather than treating different technologies as interchangeable.

Conclusion — Technical Performance Supports Long Service Life

High-grade architectural anodising combines an established electrochemical finishing process with controlled manufacturing, technical standards and quality verification.

Its potential for long-term performance depends on several important factors.

Anodic film thickness, effective sealing, aluminium alloy selection, processing conditions and the intended environmental exposure must all be considered.

Australian and international standards provide a valuable framework for establishing performance expectations and verifying the completed finish.

At the same time, architects must recognise that protective finishes are only one component of a complete building system.

Environmental durability, structural performance and fire compliance require appropriate consideration at the relevant material, product and assembly levels.

AAF Queensland is committed to supporting the correct specification and use of high-grade architectural anodising.

Our Research & Data Centre aims to make relevant technical information, research findings and recognised standards more accessible to architects, designers, fabricators and building owners.

Long service life begins with an appropriate specification, controlled processing and verified performance.

Research References and Further Reading

1. Standards Australia
AS 1231:2000 — Aluminium and Aluminium Alloys: Anodic Oxidation Coatings.
Australian requirements for protective and decorative anodised aluminium.

2. International Organization for Standardization
ISO 7599:2018 — Anodizing of Aluminium and Its Alloys: Method for Specifying Decorative and Protective Anodic Oxidation Coatings.

3. Fenestration and Glazing Industry Alliance
AAMA 611-24 — Specification for Anodized Architectural Aluminum.
North American architectural anodising requirements.

4. International Organization for Standardization
ISO 3210:2025 — Assessment of Quality of Sealed Anodic Oxidation Coatings by Measurement of Loss of Mass After Immersion in Acid Solutions.

5. International Organization for Standardization
ISO 2931:2017 — Assessment of Quality of Sealed Anodic Oxidation Coatings by Measurement of Admittance.

6. Standards Australia
AS 4312:2019 — Atmospheric Corrosivity Zones in Australia.

7. Standards Australia
AS 3715:2025 — Metal Finishing: Thermoset Powder Coatings for Architectural Applications of Aluminium and Aluminium Alloys.

8. Australian Building Codes Board
National Construction Code.
Building performance and fire safety requirements.

9. Geoscience Australia
Aluminium — Australian Mineral Facts.
Technical background on aluminium material properties.

10. QUALANOD
Specifications for the QUALANOD Quality Label for Sulphuric Acid-Based Anodizing of Aluminium.
Industry quality assurance and production control requirements.

11. Wyllie, B. (2025)
Low-carbon Aluminium is a Great Start — Next, Aluminium's Journey to Further Optimise Sustainability.
7th Australasian Aluminium Extrusion Conference, Brisbane.

This paper provides general technical information. Relevant standards, amendments, test methods and project-specific requirements should be checked against current authoritative publications before final specification. It is not a substitute for professional engineering, fire compliance or product certification advice.

Explore Further

Research-01 — Anodising: The Technology
Understanding the electrochemical process, architectural finishes and the distinction between anodising and powder coating.

Research-02 — Sustainability & Environmental Performance
Independent research into environmental product declarations, carbon emissions and whole-of-life performance.

Research-03 — Durability & Real-World Evidence
Historic buildings and documented examples of architectural anodising remaining in service for decades.

Research-05 — Specification, Certification & Maintenance
Practical guidance for selecting finishes, approving samples, verifying production and maintaining architectural aluminium.

Discuss Your Project with AAF Queensland
Technical assistance with architectural finishes, film thickness, environmental exposure, samples and specification.

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