



Solid aluminium for  
facades with fantasy



Whether for renovation or for new projects, it is always economic aspects that prompt the use of pre-painted aluminium as a material for facade claddings with ventilation.

The reasons for these decisions include a wide variety of design possibilities, longevity and very low operating expenses during the use of the building.

Apart from weather-proofing, the material must meet stringent requirements in respect to the physical properties.

Novelis has developed solid pre-painted aluminium products in different thicknesses especially for facade cladding:



pre-painted aluminium for facades,  
2.0 mm thick



pre-painted aluminium for facades,  
3.0 mm thick

ff2<sup>®</sup> und ff3<sup>®</sup> - ideal for facades:

- Non-combustible - A1 certified according to DIN EN 13501
- Especially weather-resistant PVdF coating
- Extremely flat, low stress
- High strength, wide span-widths, economical
- Very low maintenance requirements



Beloura, Portugal

# Alloy for higher span-widths extremely flat – stress-free – high strength

ff2<sup>®</sup>, a product developed especially for facades, is made from a special AlMg3 alloy; with a thickness of only 2.0 mm.

This alloy ensures the same strength as conventional AlMg1 alloys with a thickness of 3.0 mm. This means that the weight of material to be handled and installed is reduced by a third and that the same span-width can be obtained with a lower material thickness. The material is ideal for minimizing material, installation and transportation costs.

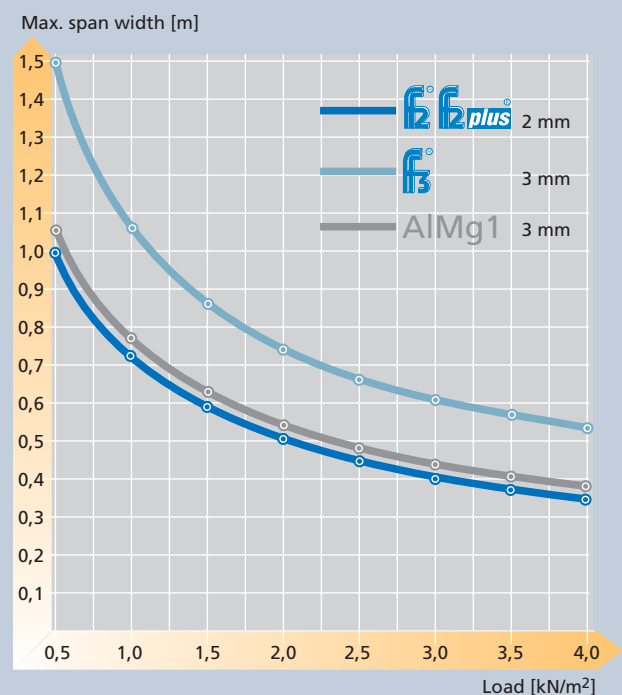
AlMg3, thickness 2.0 mm = 5,4 kg/m<sup>2</sup>

AlMg1, thickness 3.0 mm = 8,1 kg/m<sup>2</sup>

Even in large-surface applications and under extreme stress, for example in high-rise buildings with extreme wind loads, ff2<sup>®</sup> is convincing. The material has a low weight per surface area, at 5.4 kg/m<sup>2</sup>. Nevertheless, effortlessly the solid aluminium material stands up to high wind loads. Building movements and temperature changes are compensated without any problems. As the aluminium alloy is seawater-resistant, ff2<sup>®</sup> and ff3<sup>®</sup> can be used in extreme climate zones (Germanischer Lloyd test certificate).

Load [kN/m <sup>2</sup> ]	ff2 <sup>®</sup> /ff2plus <sup>®</sup>	AlMg1	ff3 <sup>®</sup>	Max. span width [m]
0,5	1,00	1,02	1,50	
1,0	0,71	0,72	1,06	
1,5	0,58	0,59	0,87	
2,0	0,50	0,51	0,75	
2,5	0,45	0,46	0,67	
3,0	0,41	0,42	0,61	
3,5	0,38	0,39	0,57	
4,0	0,35	0,36	0,53	

according to DIN EN 4113, DIN EN 1396



## Structural design comparison ff2<sup>®</sup>, ff3<sup>®</sup>, AlMg1



Sports arena, Omsk

# Surface quality for longevity and economics

*Extremely UV-resistant surface*



Fraunhofer Institute, Dresden

## UV-resistant Coating

The decisive factors for a durable colour effect are colour consistency and surface durability. This is why we coat ff2® and ff3® pre-painted aluminium in a continuous coil coating process.

Solid and metallic paints are applied in two or four coats and then permanently stove-enamelled. This process ensures a durable, brilliant colour effect.

For high-grade outdoor architectural applications, Novelis uses only PVdF (polyvinylidene fluoride) paints of the highest quality (80/20). As a general principle, the higher the PVdF share in the paint, the better the weather resistance. PVdF paints contain mainly inorganic pigments and are extremely well-suited for outdoor applications. They feature high resistance to ultraviolet radiation and environmental effects.



Fraunhofer Institute, Dresden



北誠世界貿易

北誠世界貿易大樓

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彰化銀行 CHANG HWA BANK

運貨快超

## Durable Novelis PVdF paint quality

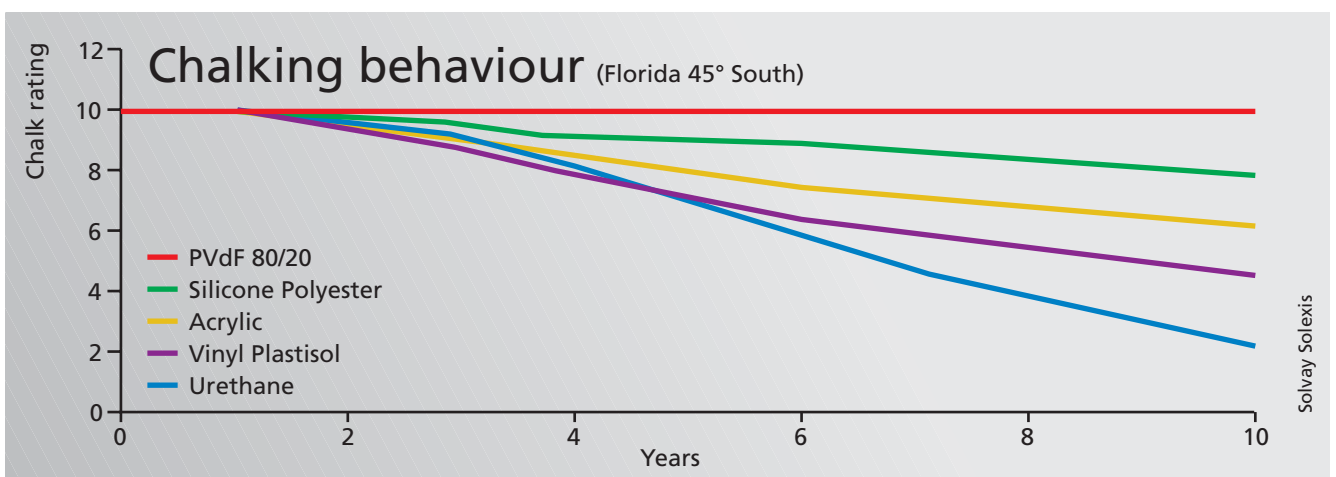
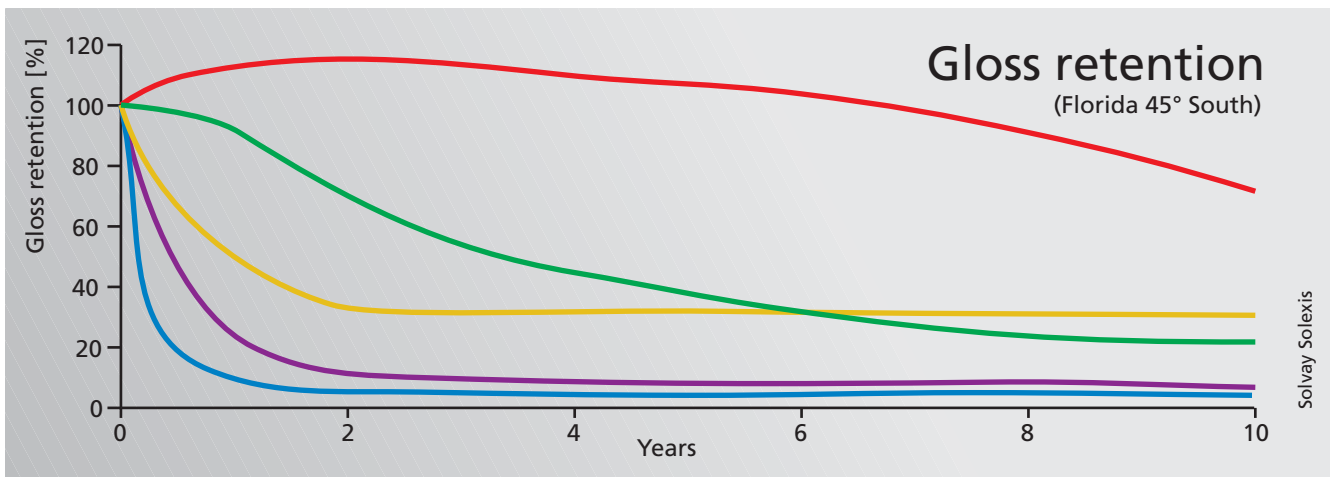
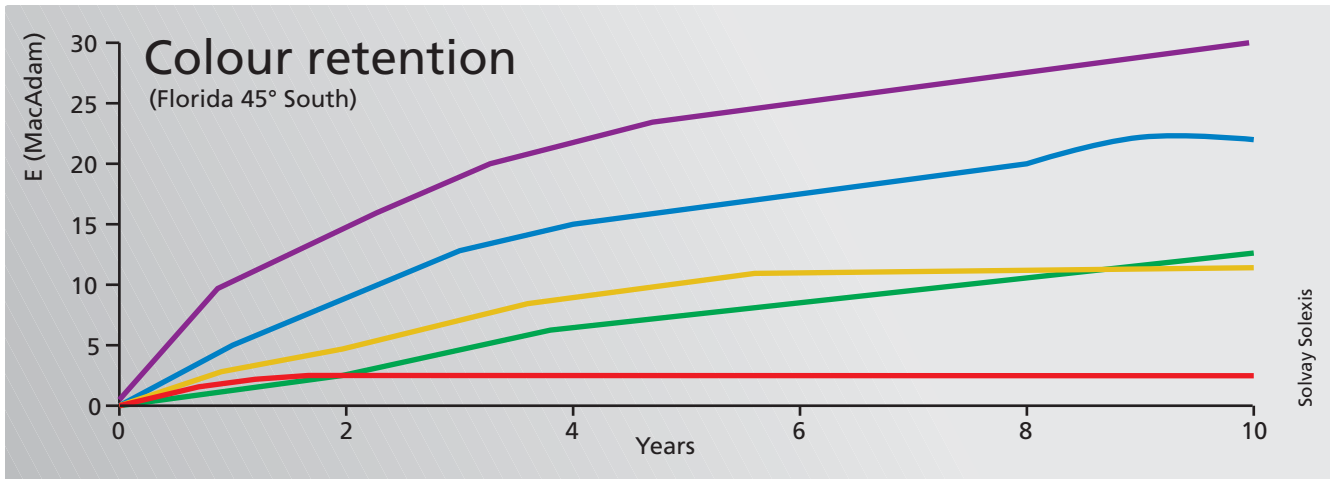
During the outdoor weathering tests of different paint qualities, the following parameters are investigated:

1. Colour retention
2. Gloss retention
3. Chalking behaviour

Our Novelis test procedures are far more stringent than the normal ECCA test standards.



KNHC Deagu H.Q., South Korea





Casino, Moscow

## Cleaning

PVdF coatings present a highly cross-linked surface - easy to clean. In contrast to polyester-coated aluminium cladding, ff2® and ff3® facades are dirt-repellent and require very little maintenance.

Minor dirt, if necessary, can environmentally friendly be cleaned off using warm water and neutral detergents.

Graffiti can normally be removed using special cleaning agents.



Beloura, Portugal

## Colours for modern architecture

Metallic shimmer or high-gloss to matt: many solid and metallic colours, copper tones, terracotta and stainless steel effects - we are continuously developing new surfaces for individual accents in architecture.

Special colours are available on request.



Naval authorities, Rostock





Museum of Modern Art, South Korea

## Easy processing

Whether you prefer panels, cassettes or flat sheets and whatever type of substructure you prefer, ff2® and ff3® are equally well-suited for ventilated and non-ventilated cladding structures. Especially the easy forming properties of ff2® make the material ideal for concave or convex shapes, corners, closures, column cladding and other details.

Coil-coated aluminium can be processed after coating.

Cassettes and panels are produced taking the minimum bending radius and the processing temperature into consideration (see technical data).

**ff2® and ff3® can be drilled, stamped, punched, bent, edged and stud welded without any problem or any damage to the material or onto the coating.**

For protection from damage and dirt during transportation, processing and installation, the material is supplied with an ultraviolet-resistant protective foil on the visible side.

This foil remains on the sheet during installation and is simply pulled off after the completion of installation. The foil is recyclable and has no impact on groundwater.



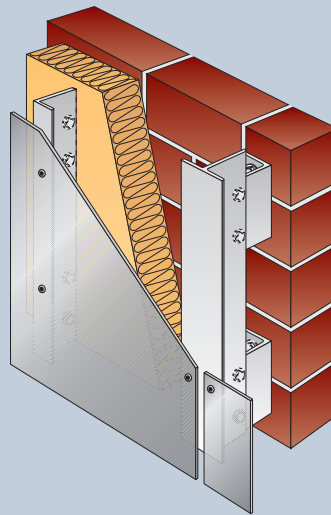
The Wave, Netherlands



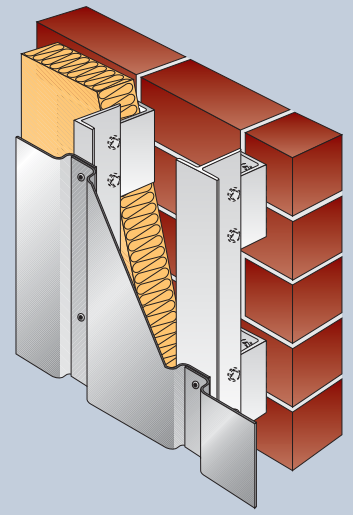
BMW car dealer, Hamburg

## Installation techniques

Apart from conventional fastening techniques for facade cladding, bonding and stud welding (ff3®) are possible installation methods for invisible fastening.



flat sheet



panel



The Wave, Netherlands



Fraunhofer Institute, Dresden

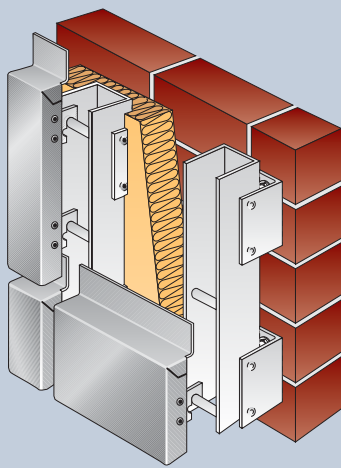


Museum of Modern Art, Busan

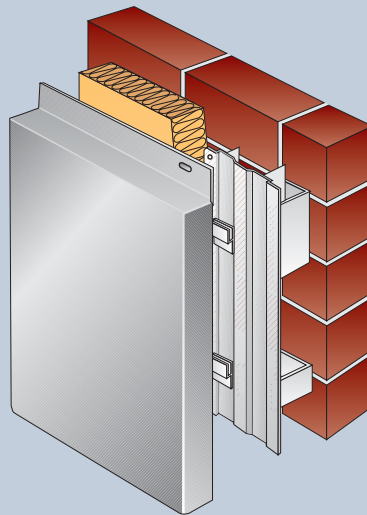
## Adhesive bonding

The paint on the reverse side of Novelis facade material is specially designed for bonding. For this reason ff2® and ff3® sheets can be adhesive-bonded to the sub-structure without any visible fixings.

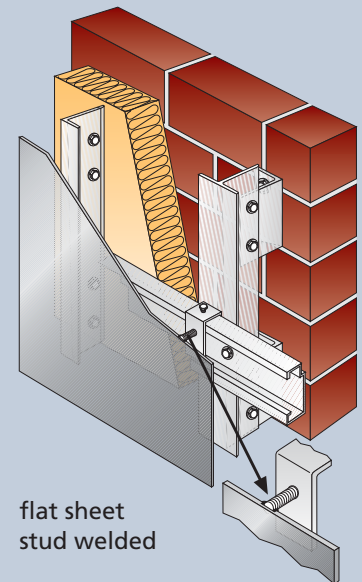
Reinforcements can easily be bonded into the cassettes.



cassette mit hook-in-system



cassette mit non-visible fixing



flat sheet  
stud welded



KNHC Deagu H.Q., South Korea

## Stud welding for ff3®

Stud bolts can be welded to pre-painted aluminium for the concealed installation of façade panels. For this purpose, the surfaces of the components, bolts and panels, are melted for a short time (less than one second).

The alloy used for ff3® features excellent welding properties and is ideally well-suited for stud welding on the reverse without any impact on the decorative front side.

Quality assurance for stud welding joints is described in DIN EN ISO 14555.



The Wave, Netherlands

## Facade installation

The most important requirement is a tension-free installation with fixed and sliding points. The substructure should preferably be made from aluminium instead of wood or steel so that it has the same thermal expansion behaviour as the cladding material itself.

Fixed points bear the weight of the material, whereas sliding points accommodate wind loads. This type of installation ensures that thermal expansion can take place as necessary.

Another decisive factor is the difference between the installation temperature and the highest or lowest temperature expected on the installed facade.



TV Tower, Shanghai

## Fire leaves us cold!

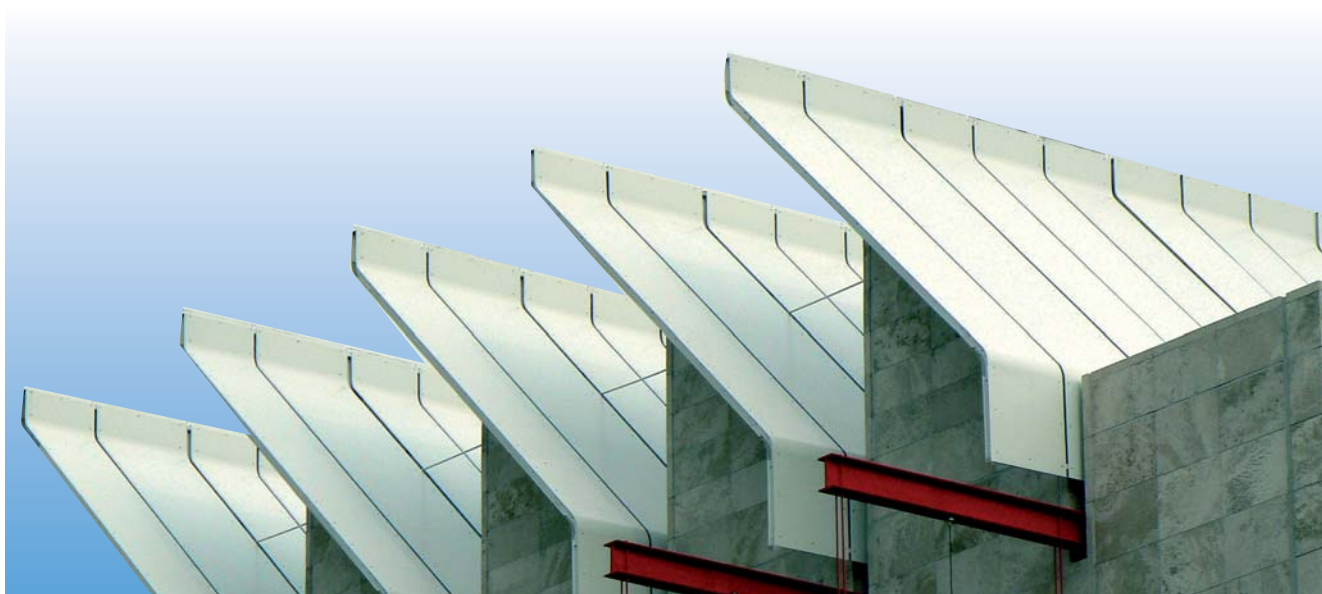
Novelis pre-painted aluminium has been certified in accordance with the latest EN 13501 non-combustibility standards. Under international building regulations, only non-combustible materials may be used in buildings which are exceeding a certain height (approx. 20 m).

For public facilities such as kindergartens, schools, hospitals, hotels, airports, etc., this requirement applies irrespective of the height of the building.

Novelis ff2® and ff3® facade products received the highest rating of A1 in the combustibility tests.

ff2® and ff3® also obtained convincing results in the categories of smoke development and dripping fires.

**This means that ff2® and ff3® can be used on any building of any height without any restriction.**



Broad Contemporary Art Museum, Los Angeles

## The facade option for stringent acoustic requirements



ff2 plus® is the ideal base material for hospitals, concert halls and buildings which require a high level of insulation against structure-borne noise and /or enhanced levels of insulation against air-borne noise.

With very low sound emissions to DIN 4109, ff2 plus® ensures demanding facade designs even in acoustically sensitive areas.



## Aluminium is environmentally friendly

Novelis pre-painted aluminium is produced by the environmentally friendly coil coating process. All paints and lubricants are processed in a closed material cycle. When stoving the lacquer, 100% of the extracted solvents are combusted and fed back into the process. The pigments used in the paints are non-hazardous; indeed some of them are approved for use in food.

ff2®, ff2 plus® and ff3® pre-painted solid aluminium are free from heavy metal erosion, are ground water neutral and can be recycled as a raw material without any loss of quality.

Novelis pre-painted aluminium is produced using 85% recycled (secondary) aluminium.

# Technical Data

## Alloy

Novelis WG-535, EN AW-5754 (AlMg3) to EN 573-3, AA 5754 (international designation)

## Dimensions

 Panels in standard dimensions

Thickness: ff2<sup>®</sup>: 2.0 mm

ff2 plus<sup>®</sup>: 2.2 mm

ff3<sup>®</sup>: 3.0 mm

Width: 1500 mm, Length: 3000 mm

Special dimensions on request

## Coating thicknesses

Front face approx. 24 µm, metallics up to 40 µm, reverse face approx. 3 µm

## Gloss

Approx. 20 units as per the Gardner measuring system, measuring angle 60°.

Metallic colours approx. 30-40 units, 30 units for ff3<sup>®</sup>

## Mechanical properties

Temper: H 42 to EN 1396

Tensile strength: Rm 220 - 260 MPa

Elongation limit: Rp 0.2, 165 - 215 MPa

Elongation: A 50 >9%

Permissible stress: Z<sub>perm</sub> - 96 MPa to DIN 4113

## Colours

Colours as per current Novelis colour chart as well as special colours developed on the basis of RAL, NCS etc. or on customer request. Special and customised colours available from a min. quantity of 1500 m<sup>2</sup>.

## Linear expansion

Coefficient of linear expansion 0.024 mm/m/°C

## Installation

For a tension-free installation please consider also the following: We recommend to use only panels from a single production batch. Especially all metallic colours must be installed in the same coating direction. Precise instructions for the laying direction are printed on the reverse face of the facade panels.

## Elasticity

Modulus of elasticity -70,000 MPa

## Fire protection

ff2<sup>®</sup>, ff2 plus<sup>®</sup> and ff3<sup>®</sup>

are non-combustible to EN 13501-A1



## Quality control and Certificates

Quality checks are based on Novelis' factory standard, EN, DIN, ASTM and BS standards and ECCA guidelines\*).

Quality assurance has been certified to ISO 9001.



\*) ECCA: European Coil Coating Association, Brussels. The members of the ECCA undertake to maintain the consistently high quality of precoated materials and to ensure their suitability for use in the construction industry. Novelis is a member of the ECCA.



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