General recommendations

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Introduction

Rolled zinc, a durable and versatile material, is used worldwide for its technical and aesthetic qualities.

This guide provides general advice to facilitate its use and ensure high-quality results. It reminds of the fundamental rules relating to the use and proper installation of zinc and VMZINC® systems.

By complying with the recommendations, project owners, architects and installers use high performance and durable materials.

As each country has its own specific characteristics and regulations, it is important to contact local teams to ensure compliance. Any use or specification outside the scope of application indicated and/or the specifications in this guide requires specific consultation with the technical services of VM Building Solutions®, without the latter being held liable for the feasibility of the design or implementation of such projects.

We would like to remind you that the prescription of complete construction systems for a given structure remains the exclusive responsibility of building contractors, who must ensure that the products prescribed are suitable for the construction purpose of the structure and compatible with the other products and techniques used.

It should be noted that the proper use of this guide presupposes knowledge of zinc as a material and of the roofing and facade construction trades.

France - Mulhouse
Learning Centre

Architect	Huques Klein
Contractor	RH Couverture
Technique	VMZINC® standing seam
Appearance	AZENGAR®
Surface	2500 m²
Copyright	Paul Kozlowski

VM Building Solutions® cannot be held liable for any consequences resulting from specifications or installation that do not comply with all VM Building Solutions® specifications, as well as the aforementioned standards and practices.

Metal and its origin

VMZINC is the international brand name for rolled zinc products and systems for building envelopes. Its origins date back to 1837 and the historic name of the Vieille Montagne company, which played a major role in the rise of zinc in construction and, in particular, lent the characteristics of its products to Baron Haussmann's "new Paris".

Known to roofers in France for over 185 years, the VMZINC® brand is a benchmark for quality and reliability, chosen for its durability, reliability and aesthetic of the finishes. VMZINC® offers an unrivalled range of solutions for roofing, facades, rainwater collection and ornamentation.

Zinc alloy

Zinc is a flexible and lively material that lends itself easily to shaping and bending. It is a natural element extracted from ore. A metallurgical process, comprising roasting the blende, reducing the zinc oxide obtained and refining it by electrolysis, produces the zinc used in construction. Sheets, coils and rolls used in the production of standard products are produced by hot rolling.

Older laminates, made from thermal zinc, i.e. zinc containing a significant proportion of impurities (lead, iron, cadmium), exhibited higher expansion and creep than today's products. New alloys, made from very pure zinc obtained by electrolytic processing and the addition of controlled quantities of other elements (copper and titanium), improve their properties. The addition of copper makes the alloy harder and increases its mechanical strength, giving it a natural natural patina and a greyer appearance (the patina was whiter with the old alloys). The addition of titanium increases the material's creep resistance (particularly under the effect of alternating thermal stresses).

VMZINC® rolled zinc complies with European standard EN 988, guaranteeing 99.995% zinc purity before the addition of copper and titanium, as well as strict compliance with physical, mechanical and dimensional characteristics.

Compliance with this standard means that structures built using this material are covered by a ten-year guarantee.

What is PREMIUM zinc?

To maintain the highest level of quality, VMZINC® has created the PREMIUMZINC® label, which exceeds the requirements of standard EN 988.

This label is more stringent in certain respects, particularly in terms of flatness and chemical composition. In addition, roofers and fabricators find important tests that are not required by the EN 988 standard, including bending tests at 4°C and deep drawing tests.

Physical characteristics

- density: 7,2 kg/dm3
- coefficient of expansion: 0,022 mm/metre/C° for a delta of 100 °C
- melting point: 419,5 °C
- Recrystallisation temperature: 300 °C
- modulus of elasticity (E) at 0.2%: 120–150 N/mm²
- thermal conductivity coefficient: lambda: 110 W/m. °K
- tensile strength: 150 N/mm²
- flexural strength: not applicable for zinc sheets, only tensile strength
- Puncture resistance: Vickers hardness: HV=61 (Auby laboratory; not a standardised value)

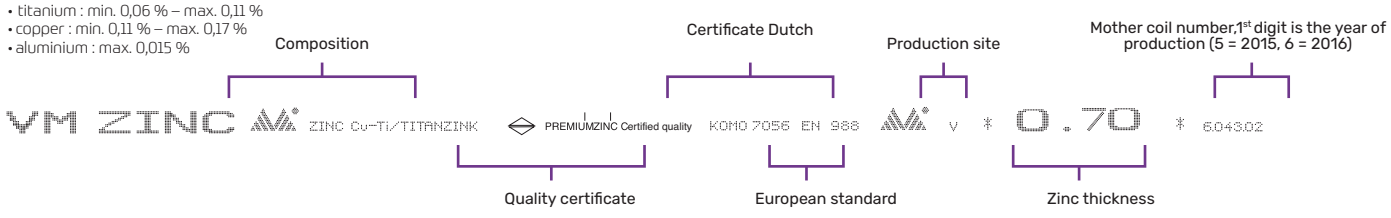
Marking

To ensure traceability and guarantee professionals the superior quality of the zinc used, all finished products are stamped, and sheets and coils are marked with ink with the VMZINC® brand name and key characteristics.

In particular, the marking guarantees compliance with standard EN 988 and the requirements of the PREMIUMZINC® label.

Composition

- titanium : min. 0,06 % – max. 0,11 %
- copper : min. 0,11 % – max. 0,17 %
- aluminium : max. 0,015 %



The metal and its origins

Characteristics of zinc

Resistance

VMZINC® offers buildings durable envelope solutions that can withstand most climates.

VMZINC® roofing applications in particular ensure water and snow tightness from 3° (5%).

The roofing and façade systems developed by VMZINC® can withstand extreme wind loads and are fire resistant.

Better than any other material, due to its mechanical characteristics, zinc allows all rainwater drainage systems to withstand the most violent weather conditions, significant temperature variations or UV rays in very sunny areas.

Ease of soldering

Zinc has the distinctive feature of being very easy to weld, unlike other metals such as aluminium, which requires complex stapling to ensure watertightness, a technique that takes longer to implement.

Adaptability

VMZINC® products are suitable for all types of buildings and allow complete freedom of architectural expression: assemblies with varying degrees of definition and no visible fixings, adapting to the most complex shapes (conical, curved with single or double curvature).

Malleability

Architects' creativity has no limit, and neither does zinc. Thanks to its malleability, it adapts to the most original shapes, emphasises the building's volume and is easy to work with: recesses: uneven surfaces or unusual angles are no obstacle to zinc design.

Whether used on roofs or façades, zinc offers great design freedom:

- the material adapts to all slopes from 3° (5%) up to vertical
- it adapts to complex shapes that are difficult to achieve with other materials and bends to small radii of curvature thanks to its unrivalled malleability
- roofers can easily work on rainwater systems and carry out complex finishing work on site, which is impossible with PVC, for example, which does not have this malleability.

Standing seam roofing VMZINC® - PIGMENTO® lichen green - Architect: Bamboo – Caraman – France

Standing seam roofing VMZINC® - ANTHRA-ZINC® - Architect: Karim Nader Studio – Faqra – Lebanon

Surface finishes VMZINC®

Natural zinc VMZINC®

VMZINC® natural zinc has a slightly shiny finish. When exposed to air, water and UV rays, a layer of basic zinc carbonate forms on the surface of the zinc.

This layer, known as a "patina", protects the zinc from corrosion. Natural zinc develops its patina after 6 months to two years, depending on the surrounding environment and its location on the building.

AZENGAR® engraved zinc

Clearer, more matt, more raw, AZENGAR® is engraved zinc with a heterogeneous surface punctuated with rough patches. It renews the image of zinc.

Our newest innovation is the AZENGAR 3R, the first titanium zinc in the industry made of 100% titanium zinc scrap and the first 100% circular VMZINC product.

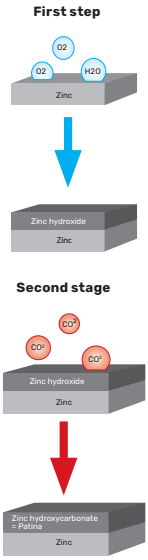
Pre-weathered zinc VMZINC®

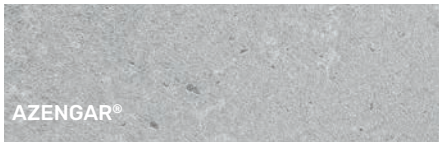
The patina is obtained through a carefully controlled industrial conversion process, which involves immersing the rolled zinc in a solution that permanently alters the crystalline structure of the metal's surface. The resulting zinc phosphate layer is insoluble in water and therefore completely harmless to the environment. Measurements taken over several years, showing that the amount of zinc phosphate contained in the surface layer of the metal does not vary, have largely confirmed this hypothesis.

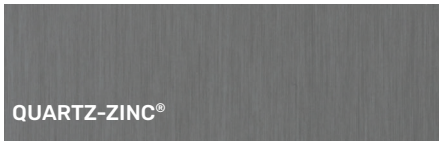
QUARTZ-ZINC® and ANTHRA-ZINC® pre-weathered products are therefore the result of a surface treatment process applied to natural zinc.

This is a natural, accelerated patina and not a paint or colouring. Like any patina, this change in the crystalline structure of the metal on both sides evolves over time. It is therefore normal to see slight variations in colour when installing on the same roof slope or façade section.

VMZINC®'s pre-weathered zinc range is unique in terms of surface appearance. Its wide range of six shades allows for combinations with other materials that are often original, sometimes unexpected, but always harmonious: wood, brick, slate, concrete, glass, etc.







Contact your local VMZINC team (local contact on the last page).

VMZINC® surface finishes

QUARTZ-ZINC®

QUARTZ-ZINC® is a velvety grey zinc which reproduces the patina that zinc naturally develops when first exposed to the atmosphere. This surface appearance is highly valued in renovation projects as it blends in better with old zinc.

ANTHRA-ZINC®

ANTHRA-ZINC® is a pre-weathered zinc with an anthracite grey appearance that blends well with slate, with which it is often combined.

PIGMENTO®

PIGMENTO® offers a range of pre-weathered zinc products with coloured finishes that preserve the natural texture of the QUARTZ-ZINC® substrate. The specific 35 µm organic coating of PIGMENTO® on one side and 12-13 micron coating at the back complete the protection.

Bespoke PIGMENTO®

VMZINC® offers architects the opportunity to develop original colours and shades to meet the specific requirements of their project. For each request for a new colour, a minimum quantity of approximately 3 tonnes is required.

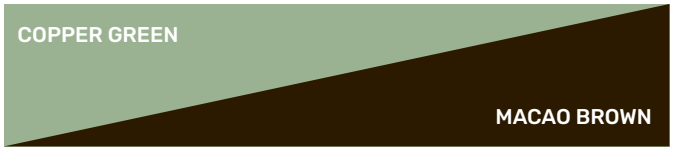
After several weeks, the VMZINC® teams will submit prototypes of the desired colour to the project specifier for approval. Only after approval by the client or project manager will the custom PIGMENTO® be produced.

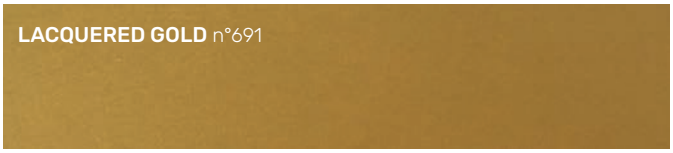
VMZINC® lacquered zinc

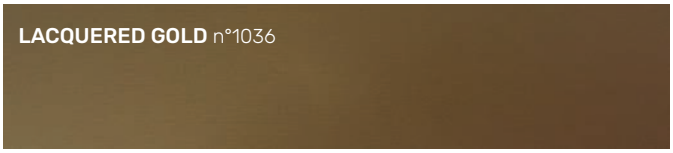
Unlike pre-weathered zinc, which retains its natural appearance and structure, lacquered zinc is obtained by applying a 25 µm polyester lacquer that is polymerised in an oven.

VMZINC® offers several standard colours of lacquered zinc: double-sided lacquered zinc, which has a different colour on each side, and single-sided lacquered zinc.

Compared to other galvanised and lacquered metals, scratches do not cause peels or rust marks, as the exposed zinc protects itself by forming its natural patina.







Standing seam roofing VMZINC® - PIGMENTO on request - Architect: Vignault x Faure – Crac'h – France

VMZINC® surface finishes

VMZINC® black collection

These new shades for contemporary architecture offer a distinctive and elegant colour palette based on black.
These five night-time colours bring prestige and sobriety to buildings

INK NIGHT

PIGMENTO GREY

STORM GREY

CHARCOAL BLUE

MIDNIGHT BLACK

VMZINC® Ice Collection

Like the semi-precious stone that gives this collection its name, the six colours on offer are soothing, vibrant colours synonymous with purity and durability. The collection also includes l'AZENGAR®.

LACQUEREDWHITE SAND

LACQUERED SAND DUNE

PIGMENTO SAND GREY

AZENGAR®

PIGMENTO FROZEN WHITE

LACQUERED WHITE WATER

Standing seam roofing VMZINC® - PIGMENTO on request - Architect: Amélie Couffignal – Onet-le-Château – France

Standing seam roofing VMZINC® , Perforated sheets - PIGMENTO on request - Architect: Vignault x Faure – Pornic – France

Technical finishes of VMZINC®

ZINC STRAT

Thanks to its self-protective properties, zinc can be used in any type of environment.

When installed in harsh environments, it is essential that zinc be rinsed regularly to prevent aesthetic deterioration of the surface.

This is why VMZINC® has developed a unique technical pre-weathered zinc: ZINC STRAT.

ZINC STRAT is only available on QUARTZ-ZINC® and ANTHRA-ZINC® surface finishes, as these are mainly chosen for their aesthetic characteristics.

With ZINC STRAT, the protective patina combined with this new protective coating increases the resistance of the zinc and meets the aesthetic requirements of architects and project owners.

However, ZINC STRAT must be regularly rinsed by rain in harsh environments (coastal areas, seafront, industrial areas). For façade structures, it should be noted that the folds become lighter (or whiter) on ANTHRA-ZINC STRAT.

ZINC PLUS

ZINC PLUS is coated on the underside a protective layer of organic composition.

The total thickness of the layer is at least 55 µm. This protective layer on the underside of the zinc does not require any ventilation for the complex on which ZINC PLUS is installed.

ZINC PLUS extends the use of zinc to warm roofs with low to medium humidity.

ZINC PLUS is available in all surface finishes: natural zinc from VMZINC®, QUARTZ-ZINC®, ANTHRA-ZINC®, AZENGAR®, PIGMENTO® and all lacquered zinc.

ZINC PLUS is resistant to condensation forming on warm roofs beneath ZINC PLUS. However, it is not suitable for use in areas with a high risk of standing water or where the insulation and its structure are permanently damp. Good vapour barrier practice is essential for the proper functioning of complexes with ZINC PLUS.

Lichens may form on surfaces that receive little sunlight, particularly if the atmosphere remains humid and the environment wooded. As with all coated materials, PIGMENTO requires regular cleaning to maintain its aesthetic qualities. No maintenance is required for Natural zinc, QUARTZ-ZINC®, ANTHRA-ZINC® and AZENGAR® due to their self-protecting properties and natural patina.

For facades covered with artificial slate, VMZINC specifications stipulate that the finishes around doors and windows must be carried out either with the VMZINC Universal Facade Finishes system or with custom-made folded finishes in ZINC STRAT.

White efflorescence may appear if these specifications are not followed. This is mainly an aesthetic issue.

The intrinsic qualities of the material will not be affected.

ZINC PLUS ahead of its time since 1996

A roof that combines technical performance and aesthetic value.

The warm roof with ZINC PLUS is the roof of the future with high aesthetic value.

VMZINC and sustainability

The thermal characteristics of zinc and VMZINC solutions

Zinc cladding and roofing elements meet the most stringent requirements of various thermal regulations. VMZINC® solutions can be combined with thick insulation of various types. In addition, VMZINC® solutions can be attached to the structure using fastening and framing systems that limit thermal bridges and thus contribute to the thermal performance of the building envelope.

The thermal resistance of the insulation (thickness and thermal conductivity) is the most important criterion for limiting the increase in the internal temperature of a building in hot weather. Increasing the thickness of the insulation compensates for the heat generated by the cladding (material, surface appearance and substrate).

VMZINC® systems can be used to create walls with very high thermal insulation performance, thereby eliminating any influence from the material.

For buildings designed and constructed in accordance with the latest thermal regulations, the heat gain in summer from opaque walls is negligible compared to that from glazed walls.

Heat build-up in summer depends on controlling solar gain and managing ventilation during the day and night. The use of solar protection and night-time ventilation, combined with high thermal insulation of walls, are the means to be used to control the thermal heating of premises in summer, avoid the use of air conditioning or reduce energy consumption. Zinc cladding or roofing elements meet the highest requirements.

Zinc is therefore perfectly suited for cladding and roofing. Ventilation underneath contributes to cool the internal wall and regulate the temperature. Finally, unlike other metals, zinc only radiates minimal heat comparing with other materials.

Zinc is a natural element that is essential to life

Zinc is a naturally occurring element found in the environment. It is present in varying concentrations in rocks, many minerals, soil, water, air and the biosphere (animals and plants).

Zinc is an essential element for all living beings (humans, plants, animals). In humans, it is a major constituent, as it is the third most important trace element after iron and magnesium. Humans obtain it from their diet.

Source :
"Zinc is natural", Zinc and sustainable Development Factsheet, IZA.

Zinc and health Human

Humans obtain zinc from their diet because they are unable to synthesise it. The WHO (World Health Organisation) recommends a daily dose of 10 mg for children, 12 mg for women and 15 mg for men.

In men, zinc is a major component, as it is the third most important trace element after iron and magnesium. The human body contains between 1.5 and 3 g of zinc, 60% of which is found in the muscles, 30% in the bones and the rest in the liver, kidneys and prostate.

In the human body, zinc participates in a large number of biological reactions involved in:

- taste
- smell
- immune function
- foetal development
- brain development
- cell renewal
- growth
- skin protection and healing
- DNA formation.

Source :
"Naturally oxidizing metal surfaces environmental effects of copper and zinc in building applications" Éd. Heinz Hullmann, 2003 – "Zinc" Fiches de Données Écotoxiques et Environnementales, INERIS, 2000.

VMZINC and sustainability

VMZINC® solutions offer numerous advantages in meeting the requirements of sustainable construction standards (RE2020, HQE, LEED, BREEAM, etc.).

Serving the circular economy

> **Sustainable**
Thanks to its self-protective patina, VMZINC® rolled zinc offers a lifespan of 80 to over 100 years [1].

> **Recyclable**
100% recyclable by simple remelting, rolled zinc is effectively recycled in Europe at a rate of 98.5% [2].

> **Available for future generations**
Buildings using rolled zinc cladding therefore constitute an urban stock of zinc for future generations.

AZENGAR 3R sets a new industry standard with its low carbon footprint (0.70 kg of CO_2 per kg of zinc).

Serving energy-efficient and environment performance

> **The carbon footprint of VMZINC® rolled zinc**
Its entire life cycle, including the benefits of recycling, French manufacturing (short supply chain) and high durability, undoubtedly make it the most suitable metal for highperformance buildings.

> **Dynamic life cycle assessment (LCA)**
The impact of materials will no longer be calculated in a conventional life cycle analysis, where each material contributes to the building's carbon footprint, but in a so-called "dynamic" LCA. This involves weighting the impact of the different stages of a material's life cycle according to the (actual) year of greenhouse gas emissions. The earlier an emission occurs, the greater its impact. This dynamic LCA, calculated based on manufacturers' environmental product declarations (EPDs), therefore favours materials whose impact is low at the beginning of their life cycle and greater at the end.

> **The "energy" balance of VMZINC® rolled zinc**
Manufacture of rolled zinc consumes relatively little energy (grey energy) compared to other metals due to zinc's low melting point (420 °C) [3].

Elements	Melting temperature
Zinc	420°C
Aluminium	660°C
Copper	1085°C
Iron	1538°C

(1) The durability of rolled zinc - UMICORE - 2004

(2) Recycling of rolled zinc - I+C - VM Building Solutions, A3M, ADEME, CAPEB, SNED – 2018

(3) David R. Lide, CRC Handbook of Chemistry and Physics, CRC Press Inc, 2009, 90e éd., 2804 p., Relié (ISBN 978-1-4200-9084-0)

VMZINC and sustainable construction

The advantages of VMZINC® solutions

Elements	The advantages of VMZINC® solutions
Energy performance	> Very little real impact on the thermal performance of buildings (air gap and insulation) > Low embodied energy
Low-carbon construction	> Sustainable (no replacement required) > 100% recyclable (module D) > Carbon storage through the use of wood in ventilated façade and roofing systems (up to 13 kg of wood per m² on average for VMZINC® solutions > Can be dismantled by hand > No maintenance required > Manufactured at ISO 14001 sites > EPD's certified

Environmental Product Declarations

VMZINC®provides its customers with numerous Environmental Product Declarations (EPDs) that comply with EN 15804 and are verified by an approved auditor:

> FDES for the HQE approach
> IBU Certificates for the LEED standard
> BRE Environmental Profiles for the BREEAM method

These EPDs are all available in the "sustainability" section of the vmzinc.com website or on websites of each country.

Applications VMZINC®

The VMZINC® range aims to meet all market needs, whether in terms of aesthetics, ease of installation, value for money, technical performance or adaptation to building traditions.

VMZINC® therefore offers the most comprehensive range in the sector.

Facade

Our products are divided into five areas of application: Sheets and coils, pre-formed profiles, complete construction systems:

- VMZINC® standing seam
- ADEKA®
- VMZINC® interlocking profile
- VMZINC® stapled profile
- VMZINC® sinus profile
- VMZINC® overlapping panel
- MOZAIK®
- VMZINC® shingles
- ISOPLI NG36
- VMZINC® corrugated profile

Roofing

Sheets and coils in a wide range of sizes, colours, shades and packaging, complete construction systems, traditional or otherwise, warm or ventilated roofing, including preformed finishing accessories (shaped strips, ridges, edges, valleys, eaves strips, etc.) and fixed and movable fasteners allowing the zinc to expand freely.

Finishings

A wide range of products and installation tips for waterproofing and ventilating zinc roofs, as well as tile, slate and bitumen shingle roofs.

Rainwater drainage

Gutters, flashings, downpipes, elbows, rings...
The VMZINC® range is the larger one.

Ornaments

Standard or made to order, these decorative elements in zinc or copper are available in several sizes from "Ateliers d'Art Français".

Recommendations for use

Maximum length

Each system has maximum lengths that must not be exceeded during installation. Consult the technical brochures for each system to find out what these are, as well as the specific fixing brackets to be used. If your project exceeds the standard maximum lengths, please contact our Technical Department to find a suitable solution.

Transport et storage

VMZINC® material must be protected and stored in a dry, ventilated place at a stable temperature... in order to prevent the formation of white rust, which can leave indelible and unsightly marks on the roof or façade.

We therefore also advise against using components affected by white rust.

Field of use

When choosing a VMZINC® product suitable for a building's environment, professionals must take into account any potential constraints on use depending on the surface area in question.

Zinc surface can change aesthetically over time in different ways and on different rhythm depending on the type of climate, environment (marine, industrial, rural..), position on building (roof, façade...) and exposure (south, north...).

- progressive darkening in the case of AZENGAR®; matting, evolution towards a grey tint in the case of VMZINC® natural zinc;
- slight darkening in the case of QUARTZ-ZINC®;
- gradual lightening in the case of ANTHRA-ZINC®;
- in the long-term, loss of shine and colour in the case of coated zinc in line with similar products.

Please check the website of your country and/or take contact with the technical responsibles for UV specific questions on your VMZINC® project.

Acoustic properties

Traditional VMZINC® systems offer highly effective soundproofing against airborne noise (road traffic, aircraft, etc.). Their acoustic performance is enhanced by the increased thickness of the thermal insulation due to new, stricter regulations on building envelopes.

Zinc also has better acoustic performance than more rigid alloys (aluminium, stainless steel, etc.) with impact noise such as rain.

Marks may appear

- Dark marks may form on AZENGAR® on surfaces that are not exposed to regular rainwater rinsing;
- White marks may form on natural ZINC, QUARTZ-ZINC® and ANTHRA-ZINC® on surfaces that are not exposed to regular rainwater rinsing or in the vicinity of a swimming pool;
- White or dark marks may form on PIGMENTO® and on VMZINC® lacquered zinc on surfaces or cut edges that are not exposed to regular rainwater runoff.

These visible and permanent marks may affect the aesthetic appearance of the product. They are not a deterioration of the material and do not affect its lifespan. In addition, lichens may form on PIGMENTO® and double-coated zinc from VMZINC® on surfaces located under vegetation cover, particularly on low-slope roofs. In these situations, regular cleaning must be carried out in order to maintain the aesthetic qualities and lifespan of PIGMENTO® and VMZINC® double-coated zinc.

If necessary, it is recommended that you consult VM Building Solutions for further information.

For finishing where it is necessary to remove the film, it must be cut (be aware of the unlaying finishing). Do not leave the peeled part loose or shredded. This may leave visible marks.

Removal of the protective film

Our surface finishes are protected by a peelable film that must be removed within two months of the zinc being installed. After removing the film, it is necessary to protect the surface from fingerprints, scratches and dents, as well as contamination by agents or products that are aggressive to zinc.

Special cases

When zinc is installed as cladding prior to groundwork (concrete levelling, resins, backfilling, etc.), the film can remain in place to protect the appearance of our surface finishes from dirt and scratches during this phase of the project. It must be removed within 4 months.

- Similarly, when the cladding is close to the ground and work still needs to be carried out on the surrounding area, the film can be left in place during this work. It must be removed within 4 months.

The patina of zinc

QUARTZ-ZINC® and ANTHRA-ZINC® that have been recently installed must be allowed to weather properly during the first few months (at least 3 months). It is therefore not advisable to install VMZINC® pre-weathered zinc in snowy or freezing conditions, as stagnant snow or frost will prevent the patina from forming by cutting off the supply of outside air. This result is the appearance of white rust.

Zinc compatibility

Chemical reaction of zinc

White rust on the surface of zinc

On horizontal surfaces (copings, cornices) and terraces with gentle slopes, water may stagnate and prevent the air from reacting chemically with the zinc, particularly during rainy winter weather and in snowy and frosty conditions.

This disrupts the natural patina formation process, resulting in the appearance of a deposit known as "white rust".

However, this phenomenon is purely aesthetic and has no impact on the mechanical and physical characteristics of our material over time.

Corrosion of zinc from its underside

When zinc is exposed to excessive and permanent humidity (condensation) emanating from inside a building, it can be corroded to the point of perforation. Without the addition of carbon dioxide (CO_2) or the possibility of the wooden substrate drying out, the protective patina cannot form. For this reason, we do not recommend placing any film between the zinc and the wooden battens on the roof.

Ventilation (Air gap)

In order to prevent condensation, which can lead to premature corrosion of the zinc, under-roof ventilation is mandatory and must be taken into account during the design phase. This involves creating a free passage for air in the roof structure between the underside of the zinc support batten and the top of the insulation.

The thickness of this air gap shall be at least 20 mm on the façade, 40 mm on the roof and 60 mm for roof slopes longer than 12 m. A linear air inlet of at least 10 mm and a linear outlet at the ridge which is minimum 1.5 times the inlet to avoid overcompression in the roof. For example a pitched roof with on both sides 10mm inlet should have minimum 30mm outlet on the ridge (for big surfaces, check your local installation guide).

VMZINC® offers suitable accessories and finishes for every detail (ventilated eaves strips, roof vents, VM 941, 942, 943 and the new G3 ridge cap).

Its ventilation rules apply to roofs on buildings with low to medium humidity levels. Only the specific Compact and Structural systems developed by VMZINC® are exempt from this provision (warm roof).

There are different types of warm roofs: high humidity buildings:

- class 4: Compact roof,.

- class 3: structural roof.

Please refer to the regulations of the country concerned and the specific requirements of VMZINC®.

Zinc compatibility

Compatibility of zinc with other building materials

Direct contact between zinc and concrete and its derivatives (lime mortar, etc.), bitumen, PVC and, in general, all substrates other than wood is prohibited unless the system is covered by a Technical Assessment.

However, a neutral screen (impregnated felt, "wirefree" paper, paraffin-coated kraft paper, "English" paper) placed between the two allows for the installation of parapet and entablature cladding (up to 400 mm).

As a manufacturer, we always recommend the VMZINC® Delta system in cases of substrate incompatibility. VMZINC® Delta can create a vapour barrier on the cold side of the roof, be aware of the condensation flow in your build up.

With reference to page 12, fibre cement slates must be combined with coated surface finishes such as PIGMENTO®, STRAT and Laquered.
Their chemical composition and industrial processing of the slates can cause white marks to appear on ANTHRA-ZINC® and QUARTZ-ZINC®, particularly on façades.
White efflorescence may appear on uncoated surfaces, particularly ANTHRA-ZINC® and QUARTZ-ZINC®.

However, this is mainly an aesthetic issue, as the intrinsic qualities of the material will not be affected.

Interaction with other metals

Permitted contacts	Unacceptable contacts
Aluminium, Zinc, Stainless Galvanised steel, Tinned copper, Lead	Copper, Iron, Steel

Different metals are classified according to their electrolytic potential.

In practical terms, some combinations are acceptable, while others should be avoided, particularly iron and copper, as the presence of acidic or saline water (usually rainwater, especially in polluted atmospheres) causes actual electrical cells to form, rapidly corroding the zinc.

Zinc compatibility

Roofing support and facade

Compatible species	Prohibited species
Fir	Larch
Spruce	Oak
Scots pine	Chestnut
Poplar	Red or white cedar
	Douglas fir
	All wood species with a pH <5
	Particle board
	Maritime pine in prohibited species

Note

In case of contact with a material not listed above, it is advisable to check whether it is aggressive towards zinc.

Zinc is a natural material with many characteristics, some of which may not be compatible with this material. We do not recommend using it on façades, as wood releases toxic acids.

Architectural combination of zinc and wood

Compatibility between adhesives/sealants and zinc

Authorised products	Prohibited products
Polyurethanes	Acetic silicones
Non-acetic silicones	Acid epoxies
MS polymers	Ureas/melamine/phenol-formaldehyde (wood or panel bonding)
	Acrylics (depending on the reagent used)

Zinc and pH values

Zinc is not compatible with all chemicals. For example, urine, detergents, acids, anti-foaming agents, etc., which have a pH value of < 5 and < 10, can corrode zinc and even damage its appearance.

Bitumen roofs and synthetic waterproofing

Water running off bituminous roofs and synthetic waterproofing (PVC, TPO, EPDM such as Resitrix, Retridex, etc.) can cause corrosion of zinc when used in rainwater drainage systems.

Zinc compatibility

Delta VMZINC® SOLUTION (available since 1990 / More than 2,500,000 m² of surface area covered)

The Delta VMZINC® system makes it possible to install zinc on incompatible continuous substrates while reducing its unevenness by 5 to 10 mm in renovation projects and 5 mm in new construction.

The process is particularly suitable for repairing bituminous shingle roofs and waterproofing membranes, as well as for new roofing on all types of solid wood substrates (even those with a pH < 5 or > 10), including NF CTB-H particle board and CTB-X chipboard with a minimum thickness of 15 mm. In addition, the membrane allows zinc to be used on almost all substrates (stone, concrete, wood, plaster, metals, etc.) for the treatment of gutters and parapets.

The use of Delta VMZINC® membrane is limited to premises with low or medium humidity and ventilated cold roofs covered with standing seams or battens with a slope of 5% to 173%. Use in mountain climates (altitude < 900 m) is not permitted.

The principle of the system is to isolate the zinc from the incompatible substrate by inserting VMZINC® Delta highdensity polyethylene (HDPE) dimpled membrane, which acts as a separation layer, a breathing space (underneath the zinc) and finally as drainage condensate and rainwater during construction. When installing the membrane parallel or perpendicular to the gutter (both are possible), the 8.6 mm studs must face the zinc sheet, which will be fixed using specific fixing clips. As with all cold roofs, attic ventilation is essential.

For the VMZINC® Delta system, the maximum distance between the air inlet and outlet shall be 13 m, leaving a space of 6 cm between the top of the insulation and the underside of the roofing support. The air inlet at the eaves and the air outlet at the ridge must be continuous with a minimum opening of 10 mm at the bottom and treated with a VM 941, 942 or 943 kit or a traditional system at the top. In the case of renovation, the weight of the VMZINC® Delta system must be taken into account. (Zinc + Brackets + Fasteners + Membrane) and check the tear resistance of the existing substrate to meet the fastening requirements of the zinc roofing.

Chimney sweeping and ducts

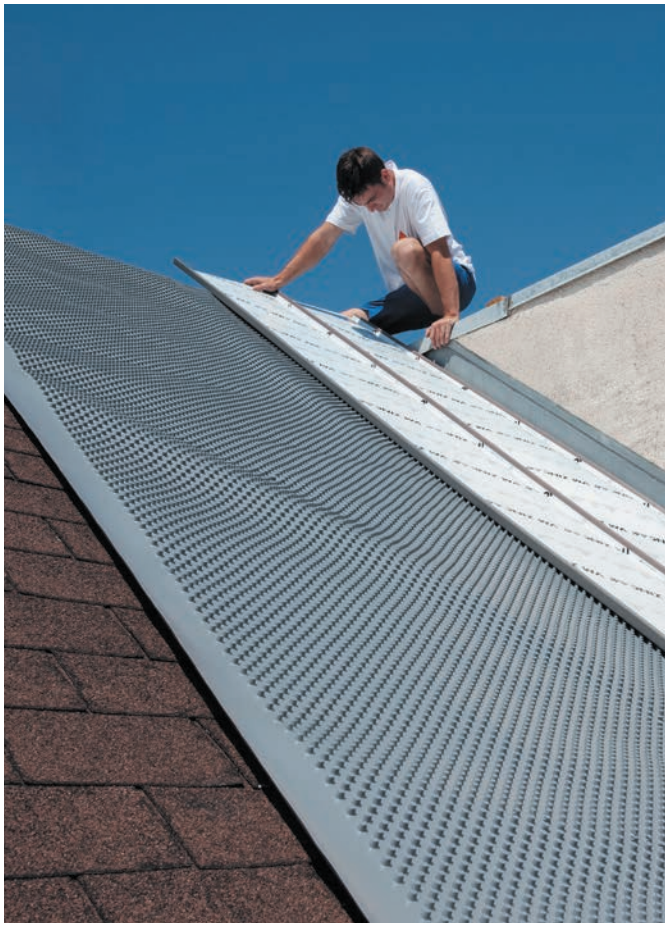
Volatile emissions from poorly adjusted or poorly maintained boiler flues can cause irreparable damage to zinc, in most cases limited to aesthetics. Particular attention must be paid to fuel oil and certain types of wood.

Proper installation and annual maintenance (chimney sweeping/inspection) can reduce or even eliminate the risk of orange (or black) stains. It is advisable to use an uncovered conical static vacuum cleaner in combination with an insulated flue to ensure good draught and less fallout on the roof, especially for oilfired boilers and wood fires. Also, the use of a "cap" at the top of the flues, which reflects and disperses smoke towards the roof, should be avoided if possible.

White rust can appear as a result of acid air fallout from sanitary ventilation.

Cleaning products

Always use pH-neutral products that do not contain harsh chemicals when cleaning windows, for example, or any other upstream elements.



Characteristics of zinc

Installation of external zinc elements

Sometimes satellite dishes, solar panels and chimney surrounds are installed on the roof after the zinc has been laid, requiring occasional work. When carrying out such work, always ensure that the overlaps, lengths and widths are correct so that water does not stagnate, and do not fix the elements with screws and nails in the middle of the troughs (through fixing), otherwise the metal will no longer be able to expand.

In general, the waterproofing solution for ducts is to use a conical cap with a collar and accessories (clamps, rails) specially manufactured for fixing solar panels. If any doubt about watertightness and/or strength, consult the VMZINC® team and the manufacturer of the component concerned.

Corrugations

Metal façades and roofing are generally made from laminated zinc sheets between 0.70 and 1 mm thick. Please refer to the technical guides for our solutions.

In all cases, we recommend using a minimum thickness of 0.80 mm for FACADES to prevent deformation due to zinc creep. For optimal results in a vertical position, we recommend using 1T coils rather than small coils and choosing QUARTZ-ZINC® instead of Natural Zinc. However, corrugations may become noticeable at certain times of the day, depending on the angle of view from which the sunlight hits the roof or cladding. It should be noted that this phenomenon is an integral part of the material and does not in any way affect the lifespan of the zinc roofing. It is an intrinsic property of zinc, which is a living material that expands and contracts with temperature fluctuations. For façades, particularly standing seam roofs, care must be taken from the profiling stage in the workshop to the handling and adjustment of the panels on site (fixings, crimping).

For example, slitting a coil into smaller widths, using a roll former with an output table that is too low or too high, inaccurate 35/45 joint dimensions, or unprotected or unsuitable hand tools can cause end-to-end corrugations. It is particularly important that the coil on the uncoiler is unwound at the height of the roller during the manufacture of the trays, otherwise the zinc may deform and cause corrugations to appear on the deck.

Ensure that this is done with care and knowledge by first reading our guide to best practices for façade installation.

Difference in shades

Our VMZINC® surface finishes may show slight variations in colour from one production run to another, visible at the time of and after film removal. These differences in shade are an integral part of the product and do not affect the intrinsic qualities of the zinc. This should be taken into account when using the product, as should the importance of the direction of the arrow on the protective film for an optimal aesthetic result.

For façades in particular, we recommend ordering all the zinc for the entire project at once so that the batch (production batch) is from the same bath. It is impossible to reproduce an identical colour tone industrially at several time intervals.

QUARTZ-ZINC®, ANTHRA-ZINC® and AZENGAR® change appearance as the self-protecting zinc patina layer forms on the surface.

Over time and with rainwater washing, the differences in colour fade until they eventually harmonise across the entire zinc surface. The speed at which the patina forms depends greatly on climatic conditions (rain/evaporation cycles, air quality, etc.) and the environment in which we therefore recommend that you wait for this phenomenon to run its course.

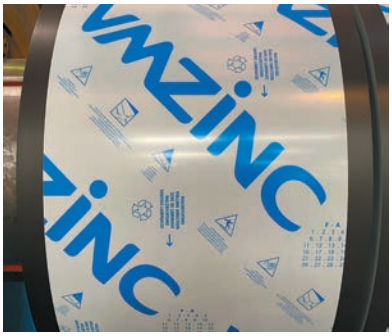
PIGMENTO® products are manufactured from QUARTZ-ZINC®. Production runs of up to 4 tonnes are manufactured from a single master coil. This means that 4 coils of 1 tonne can come from the same batch and therefore be colour-matched. For orders exceeding 4 tonnes, we can search for colour matches provided that you submit a written request. Please note, however, that this is not possible for multiple orders with different thicknesses and/or delivery dates.

Please refer to your own country website and/ or technical contacts for detailed information.

Characteristics of zinc

Direction of coil winding or rolling

A uniform or highly contrasting aesthetic can be achieved by choosing to place all the arrows in the same direction on the façade, or conversely by choosing to vary the directions.



Fire rating of zinc

The height of a building determines the level of fire safety measures to be taken, with stricter requirements as the height increases. Please refer to the VM Building Solutions teams.

All our surface finishes are classified A1 and BROOF(t1), BROOF(t2), BROOF(t3), BROOF(t4).

VM FIRE BARRIER PLUS is a A2-s1, d0 classified membrane for ventilated and non-ventilated facade applications. In the case of a non-ventilated roof, please use ZINC PLUS. For the correct use in your build up, please consult your local fire regulation. SBI tests are carried out on certain build ups, don't hesitate to contact the local VMZINC® team.

UV recommendations

PIGMENTO® can be used in environments with high UV-exposure but prolonged exposure to high UV radiation can affect the color and appearance of the product. It is essential that the installer ensures the product is used in accordance with the proposed UV recommendations for that region.

Additionally, VMZINC® offers reinforced finishes that provide enhanced durability and protection in challenging environments. By following these guidelines and considering reinforced finishes, the lifespan and aesthetic value of PIGMENTO® can be maintained.

Recommendations for PIGMENTO® are the same as for the STRAT range.

Our local service team is there to assist you in selecting the right surface treatment for your specific project needs. They can provide expert guidance to ensure that you choose the most suitable finish for the environmental conditions on your project.

Please consult the team in your country..

Supports and installation

General recommandations

The installer shall ensure that:

- the support is dry, clean and free of dust/grease/debris (nails, leaves, vegetation, etc.)
- for roofing, the flatness of the substrate complies with the tolerance of maximum 2 mm unevenness between battens and spacing of 5 to 10 mm
- the substrate is compatible with VMZINC® requirements, as set out in our technical guides the fixings have flat heads and do not protrude from the
- substrate to avoid friction and impediment to the expansion of the zinc.

Prevailing winds

The direction of installation is determined by the direction of the prevailing winds in order to avoid any risk of infiltration during heavy rainfall.

Dimensions

The installer must adapt the width and thickness of the zinc to the roofing and façade system used, the geographical area and the architects' expectations.

It should be borne in mind that reducing the width of the sheets, increasing the thickness and the number of fixing clips are all ways of ensuring good wind resistance (depending on the climate, exposure and height of the building) and, consequently, watertightness and rigidity.

The commonly used thicknesses available are: 0.70 mm or 0.80 mm for roofing and 0.8 to 1 mm or even more for facades.

For cladding, the thickness will be increased to improve the rigidity and flatness of the zinc elements. For example:

In standing seam systems, the maximum width shall be 500 mm (centre distance 430) and the minimum thickness 0.70 mm or even 0.80 mm in the case of special requirements. For interlocking profiles, 1 mm is recommended.

Please refer to the best practices and standards applicable in your country.

Expansion

All VMZINC® systems have been developed to take into account the effects of expansion (shrinkage and elongation). During installation, connections (chimneys, edges, frames, ridges, gutters, etc.) must be treated with "play", i.e. leaving a few millimetres of space so that the zinc elements can be assembled one by one without forcing them, allowing the metal to contract and expand according to the temperature.

As a reminder, zinc expands at a rate of 0.022 mm per metre per degree Celsius.

The underlay

A layer of insulating material is (usually) laid under the ventilated space. To prevent the insulation from blocking the ventilated space during installation and to ensure optimal insulation performance, it is essential to install a roof underlay (roof covering) or rainscreen (facade) over the insulation. We recommend using VMZINC® Membrane for this purpose. The waterproofing of the lower layer of the roof is the first requirement, from a physical building perspective, for achieving a high-quality roof.

This underlay or rainscreen must be waterproof and vapourpermeable and must extend to the outside of the building, into the gutter or eaves for roofs.

Cold bonding of the underlay also prevents cold air from outside circulating towards the inside of the insulation and condensation water returning into the complex. This applies to slopes ≤ 14°.

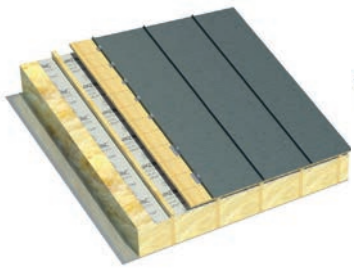
Example :

In case zinc temperature differences range from -20°C in midwinter to +80°C on the surface of the metal in full summer sunlight:

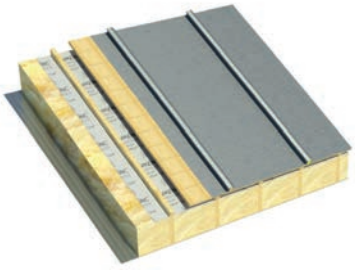
When installed at an ambient temperature of 20°C, zinc can therefore expand by 60 degrees in summer (=> temperature difference between 20°C and 80°C) and contract by 40 degrees! (=> temperature difference between 20 °C and -20 °C)

For a 10 m long profile

- Expected elongation:
  0,022 mm x 10 x 60 = 13,2 mm
- Expected shrinkage:
  0,022 mm x 10 x 40 = 8,8 mm



VMZINC® standing seam on ventilated support



VMZINC® roll cap on ventilated support

Working with zinc

Soldering

This technique is simple and requires the usual tools used by zinc roofers. To achieve a strong soldered joint, it is essential to prepare the parts to be assembled correctly:

- With Zinn 7 for natural zinc and for AZENGAR®
- With Deca +Zinn 7 for ANTHRA-ZINC® and QUARTZ-ZINC®
- With a brush + Zinn 7 for PIGMENTO® and lacquered zinc

Proper soldering is achieved when the two parts overlap sufficiently and have been thoroughly cleaned and stripped.

The contact between the two parts must be as smooth and uniform as possible to promote good solder capillarity.

On site, it is important to prevent the soldering iron from cooling down due to wind and humidity, otherwise the temperature required to perform the solder joint will not be reached.

VMZINC® now sells lead-free solder bar to protect the health of the installer (no harmful emissions thanks to lead-free content) and preserve the environment.

Fixing

VMZINC® provides the appropriate fixing clips for each system. These brackets must be used to comply with VMZINC® guidelines and achieve optimal results (aesthetic appearance and long-term durability of the system).

Sliding clips, profile No. 1 | Fixed clips profile No. 1 | Sliding clips profile No. 2 | Fixed clips profile No. 2

Clips for fixing edge strips | Sliding single-screw clips | Fixed single-screw clips

Special single screw fixing screw 6 x 40mm | Delta sliding clip | Delta fixed clip | Delta leaf clip

Bending radii

- Natural Zinc, QUARTZ-ZINC®, ANTHRA-ZINC®
  Minimum internal folding radius: ≥ 2 × sheet thickness
  Example: For 0.8 mm zinc, radius should be at least 1.6 mm.
- PIGMENTO® Finishes
  Minimum internal folding radius: ≥ 3 × sheet thickness
  Example: For 0.8 mm zinc, radius should be at least 2.4 mm.

Working temperature

Zinc can be installed anywhere in the world.

Below 7°C (= metal temperature), Natural zinc, QUARTZ-ZINC® and ANTHRA-ZINC® must be heated with hot air before bending. This step is necessary to avoid any stress that could cause premature tearing of the zinc's metallurgical structure of the zinc. For PIGMENTO® and Zinc STRAT, we recommend a minimum temperature of 10°C.

Zinc maintenance

Cleaning and maintenance

Organic deposits

If moss/lichens accumulate on the surface of the zinc, they must be removed with a clean, soft cloth, taking care to wipe in the direction of the zinc's rolling.

When cleaning, rinse with clean water and add pH-neutral soap if necessary (without using high-pressure jets such as KARCHER).

Grease and oil stains

We recommend carefully applying MEC (Methyl Ethyl Ketone) or acetone to the stains. MEC has the advantage of being a volatile cleaner but can be difficult to find in shops.

Please observe the following rules:

- the zinc must be dry;
- a cleaning test should always be carried out beforehand on an inconspicuous area before repeating the treatment on several locations and areas;
- Use a clean, soft cotton cloth;

Scratches and fingerprints

Zinc has a natural ability to protect itself when it comes into contact with air and rainwater.

This chemical phenomenon is called "patina formation". For light scratches and fingerprints, this has the advantage of gradually reducing them and sometimes even making them disappear!

This is why our VMZINC® services may advise you to wait rather than clean the surface.

Conversely, if the scratch is deep, it is better to replace the panel.

In general, to prevent fingerprints, nothing beats wearing clean, dry gloves!

Aerosol spray paint

Zinc does not require any special maintenance or additional treatment before or after installation.

It is therefore strongly advised not to apply any coating other than the touch-up paints recommended by VMZINC® teams.

We would like to point out that aerosol sprays are a bad idea. Although they are inexpensive and available in a wide range of colours in many shops, there is a known risk that they will generally turn white (or yellow) after 2-3 years of exposure to UV rays and the temperature variations of metals (zinc, copper, steel, aluminium, etc.) between winter and summer.

Salt deposits

Like all building envelope materials, VMZINC® products are subject to the harsh sea climate. In this environment, white deposits may form, mainly on surfaces that are not rinsed by rainwater.

This natural phenomenon is more noticeable when the building is located close to the sea and the zinc is dark in colour. These permanent marks do not affect the functionality of zinc and will not affect its normal lifespan.

As a preventive measure, washing with clean water at least twice a year will help to limit salt deposits.

Please consult the VMZINC® teams for further information.

Services

Trainings

In each country, trainings can be organised by our local teams. Theory and practical are part of those trainings. Courses are given by highly experimented international specialist of VMZINC® teams. During these courses, working on full-size mock-ups allow professionals to develop or update their competency in VMZINC® systems. Different modules in soldering, roofing and facade can be proposed according to the needs expressed.

Technical assistance

Technicians can provide technical assistance on site. They give advices about important stages of the installation of VMZINC® roofs or facades and about specific finishing details. They can go on site and help installers on technical points.

Design assistance

- Feasibility analysis
- Recommendations and drawings
- Written specification
- Protoype production
- Quantity estimates
- Library of BIM objects

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