

2012

TECHNICAL GUIDE

Working aid

First edition of the guide to use the Vestis rolled products, designed for rainwater drainage elements and for architectural solutions.



Roof and Facade Technical Department
MAZZONETTO SPA

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Mazzonetto S.p.a.

For more than 25 years Mazzonetto S.p.a. has been processing and marketing metals for the building trade. The company is now among the leaders in Europe in the market of metals and products for rainwater drainage systems, thanks primarily to their investments in research and development of new and innovative products. The company's constant development has led to a physical expansion over an area of 40,000 m², with the factory and offices occupying approx. 25,000 m².

Alongside the internal research staff, the company also calls on consultants who are experts in building technology and work on research at the IUAV University in Venice.

The company mission is to offer to architects, planners and trade experts the best possible products for roofing and wall-cladding.

The result of this philosophy is Vestis, a high performance product, guaranteed by long life with special focus paid to the final appearance.

Technical department

Mazzonetto S.p.a. has its own internal technical department, called ATR (Roof and Facade Technical Department), which, through its technicians and engineers, can offer the best solutions for planning and using its products. All those planners who are faced with using metal for the first time, have a supporting partner in ATR to find the best solutions and metals to use, according to the different projects concerned.

Planners and installers have a range of technical specifications and drawings available on how to use Vestis rolled products.

Before using Vestis you shall understand its specific features and respect the information given in this guide.



SUGGESTION:
a friendly light bulb character is ready to help you with some useful suggestions/advise



INSIGHTS:
a little character with a magnifying glass will give you some more information on the topic concerned

General features

Vestis is a flat rolled product for the building industry, formed of an aluminium core protected by a special coating which, besides protecting the metal core, also distinguishes the appearance, with a wide range of bright colours and different shades. Vestis is a very high quality performance product according to UNI EN 485-2 and UNI EN 573-3 standards for flat rolled products for the building sector.

Thanks to a strict quality control protocol, Mazzonetto S.p.a. guarantees a product that is ideal for the production of rainwater drainage elements and for the roof and façade covering. Vestis stands out for:

- its long life;
- it is extremely lightweight;
- it is competitive if compared with non-ferrous metals used in the same applications;
- it gives maximum freedom of expression to the architects for its range of shapes and colours;
- it is eco-friendly and respects the environment.

Features of aluminium alloys

The base metal for Vestis is 3000 series aluminium which belongs to aluminium alloys that contain manganese. The advantage given by manganese is that it increases the mechanical strength of the alloy and reduces the sensitivity to intercrystalline corrosion.

<i>Manganese (Mn)</i>	<i>0,9 – 1,5%</i>
<i>Magnesium (Mg)</i>	<i>0,2 – 0,8%</i>
<i>Iron (Fe)</i>	<i>0,7%</i>
<i>Silicon (Si)</i>	<i>0,5 – 0,6%</i>

With reference to European classification standards for aluminium alloys, the chemical designation given above also provides for including the letter H (Hardness), which means work hardening (the strengthening of a metal) by plastic deformation, followed by two numbers: the first number is between 1



Bauxite is a sedimentary rock that is the main source of aluminium

and 4 and indicates which process was used to achieve the work hardening, while the second figure shows the work hardening level and is between 1 and 9.

Vestis is available in two different physical states that identify two different product families: one mainly for rainwater drainage elements and one for the double standing seam.

	Aluminium alloy	Heat treating – work hardening level	Mechanical features	
			Resistance to tensile stress	Stretching
Vestis Line for rainwater drainage elements (back side with base colour)	3000 series	H-44	150-200 Mpa	3% min.
Vestis for double standing seam (grey back side)	Serie 3000	H-41	130-180 Mpa	8% min.

Vestis is a very lightweight product, greatly appreciated as it is easy to be processed and handled. Its specific weight is 2.70 kg/dm³.

<i>Nominal thickness</i>	<i>Weight in kg/m²</i>
<i>Vestis 0,70 mm</i>	<i>1,89</i>
<i>Vestis Line 0,80 mm</i>	<i>2,16</i>
<i>Vestis Line 1,00 mm</i>	<i>2,70</i>

The winning combination of the base metal and the coating make Vestis a product with excellent resistance to rust caused by the weather, and it also makes the product very easy to be worked.

The external coating is formed of:

Front side: all Vestis coils have a 40 µm thick coating.



Here is a simple table to compare the weight of metals, commonly used in the roofing field

<i>Thickness</i>	<i>Weight in kg/m²</i>
<i>0,70 mm</i>	
<i>Vestis</i>	<i>1,89</i>
<i>Titanium zinc</i>	<i>5,00</i>
<i>Prepainted steel</i>	<i>5,60</i>
<i>Copper</i>	<i>6,23</i>

Back side: all Vestis coils have a 12 μm thick back side (non visible) coating made of a grey polyester paint, while the Vestis Line rolled products have the same base colour as the visible side, also 12 μm thick.

Supply details

Vestis is sold in the form of coils, with a 500 mm wide internal cardboard core and protected by an external branded film.

Available thicknesses

Vestis is available in 0,70 mm, and the Vestis Line is available in 0,80 and 1,00 mm.

On request, other thicknesses can be produced.

Standard widths

650 – 1300 mm for Vestis.

1000 – 1250 mm for Vestis Line.

Other widths and dimensions on request

Weights

Coils from 100 to 3000 kg are available.

Recognisability

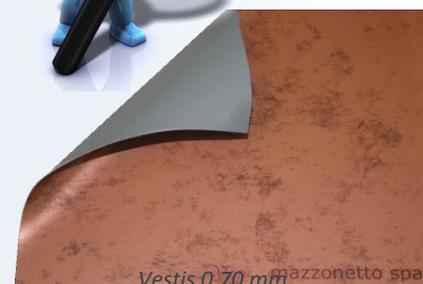
Coil marking: coils in the colours Green Roof, Copper Roof and Grey Roof are marked along the edge with the brand name "Vestis Mazzonetto spa" and "Linea Vestis Mazzonetto spa" (just for the colour Copper Roof).

Front side: all Vestis coils in 0,70 mm, are supplied with protective film. This protective film must be removed when the work is complete. It is just a temporary protection and it must be removed as soon as possible once the product has been installed. Products with film must not be exposed to UV rays for long time. For all other thicknesses the film is available on request.

Back side: all Vestis coils have the back side coated by a grey paint, while the Vestis Line coils have the same base colour as the front side.



Protection film used for 0,8 and 1.00 mm thick Vestis coils.



Storage and transport of Vestis rolled products

Despite its excellent characteristics, Vestis must be used carefully:

- do not lay down sheets, coils, or rolled products directly on the ground;
- do not pull sheets, coils, or rolled products along the ground or on rough surfaces. In such cases, besides a damage to the coating surface, there is the risk to cause undulations and folds in many parts of the product, that could turn into cracks after few years. Deep scratches can cause breaks while working or after the installation of the product, as a consequence of expansion and shrinking.

Reccomendations :

- store the product in covered and ventilated places;
- keep sheets and coils off the ground through adequate supports, that enable a good ventilation and avoid irreversible deformations of the product. In this way the surface of the material will not change;
- do not put in contact the surfaces of the material, to avoid scratches that could damage the esthetic quality of the product;
- do not lay down Vestis products on rough surfaces, only on smooth surfaces.

Transport and storage in the building site

During transport and lifting, avoid any form of rubbing or friction with other surfaces to keep intact the esthetic quality of the product.

All the material stored in the building site must be covered and ventilated.

It is important to avoid the infiltration of water between the sheets and the storage for a long period in places with high humidity.

Tests and certifications

Mazzonetto S.p.a. submitted in collaboration with the prestigious ISTITUTO GIORDANO S.p.a. the Vestis material and in particular its surface coating to strict laboratory tests with the purpose to establish the behaviour of the product under the most extreme weather conditions.

In order to achieve accurate results as a guarantee of the excellent quality of this product, the tests were conducted as follows:

- the samples were tested under high stress conditions (each sample had a double seam and deep surface scratches);
- the Istituto Giordano was asked to conduct the tests exerting a greater force for considerably longer periods of time if compared with similar tests for prepainted metals.

All the tests were conducted in accordance with the UNI standards.



Accelerated ageing in weatherometer

TEST PURPOSE: to establish how the Vestis coating colour can change over time under the action of UV-rays

RESULTS:

<p>Tested sample</p>	<p>Ageing under a Xenon lamp Grey scale</p>
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Normally flat samples are tested, whereas Mazzonetto Spa decided to test only deeply scratched and bent samples

Vestis 0,70 mm thick	5 > after 3192 hours > 4/5
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The grey scale ranges from level 1 (maximum colour change) to level 5 (minimum colour change).

Vestis achieved the result 4/5, even though it had been tested exerting the double energy if compared with the energy commonly exerted for similar tests with prepainted metals.

SUMMARY:

- Vestis undergoes slight colour changes (it can darken slightly);
- The coating does not pulverise at all.

Accelerated corrosion in salt spray chamber

TEST PURPOSE: to establish how Vestis reacts in a marine environment.

RESULTS:

Tested sample	Exposure in salt spray chamber (blistering; corrosion)
Vestis 0,70 mm thick	After 1200 hours: < 2(S2) Ri = 0

Blistering is expressed as a quantity, with values from 2 to 5, and as a size, with values from S2 to S5, where 2 and S2 are the minimum values. The corrosion level ranges from Ri = 0 (0% rust) to Ri = 5 (from 40% to 50% of rusted area). As concerns the blistering, Vestis achieved the result 2 and S2, while for corrosion it obtained 0, even though it was tested for a relevantly longer time if compared with the period of time over which the prepainted metals are usually tested.

SUMMARY:

- Vestis does not rust;
- the coating does not flake and there are no surface blisters.

Exposure in Kesternich chamber

TEST PURPOSE: to establish how Vestis reacts in industrial environments.

RESULTS:

Campione analizzato	Exposure in Kesternich chamber (blistering; corrosion)
Vestis 0,70 mm thick	After 4 cycles: < 2(S2), Ri = 0

Blistering is expressed as a quantity, with values from 2 to 5, and as a size, with values from S2 to S5, where 2 and S2 are the minimum values. The corrosion level ranges from Ri = 0 (0% rust) to Ri = 5 (from 40% to 50% of rusted area). As concerns the blistering, Vestis achieved the result 2 and S2, while for corrosion it obtained 0, even though the sample had a double seam and deep surface scratches.

SUMMARY:

- Vestis does not rust;
- the coating does not flake and there are no surface blisters.

The tests guarantee that light surface damages caused during the working and/or installation process do not expand at all.

Reaction to UV-rays

The 40 µm thick coating of the Vestis rolled products is formed by a series of specifically studied layers. The action of sunlight, no matter what height above sea level, does not change the physic-chemical properties of the coating.

The original colour of the coating may change slightly over time; however, these changes are within a very strict tolerance range. Generally speaking, after a few years there is an almost imperceptible darkening of the colour.



To understand how the colour changes, please refer to the section "Tests and certifications"

Reaction to temperature changes and to direct flame

Vestis can be exposed to very low temperatures without fear of damage, because it does not freeze. Unlike other metals, it can be bent at low temperatures with no risk of micro-crack formation. However, it is suggested to work with Vestis at a higher temperature than 0° C.

Vestis must never be exposed to direct flames; high temperature can cause irreversible damage to the material.



While using the blow torch to install the roofing felt, hold the flame at a reasonable distance from the gutter

Thermal expansion

The following table shows the thermal expansion coefficients of certain common building materials:

<i>Metal</i>	<i>Thermal expansion coefficient mm/m/°C</i>
<i>Stainless steel</i>	<i>0,0104</i>
<i>Fe 430</i>	<i>0,0108</i>
<i>Copper</i>	<i>0,0165</i>
<i>Titanium zinc</i>	<i>0,0222</i>
<i>VESTIS</i>	<i>0,0235</i>
<i>Lead</i>	<i>0,0289</i>
<i>Zinc</i>	<i>0,0290</i>
<i>Plastic</i>	<i>0,0700</i>
<i>Glass</i>	<i>0,0900</i>

e.g. Let us assume we have 10 mt long Vestis sheet.

The temperature at the time of installation is 10°C.

Remember that in summer the metal can reach a temperature of 75°C and -25°C in winter.

Summer stretching:

$$10 \text{ m} \times 65 \text{ °C} \times 0.0235 \text{ mm/m/°C} = 15.3 \text{ mm (+7.65 mm per side)}$$

Winter shrinking:

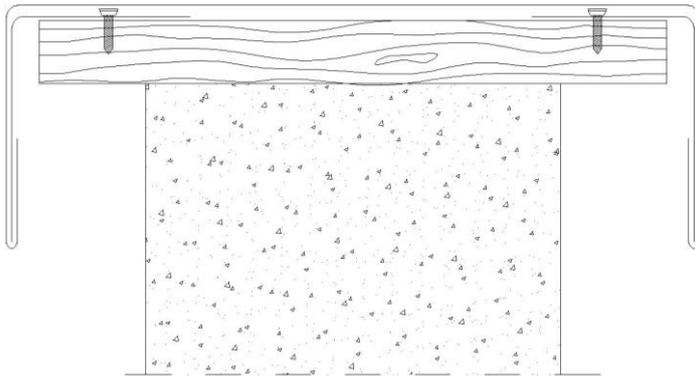
$$10 \text{ m} \times 35 \text{ °C} \times 0.0235 \text{ mm/m/°C} = 8,2 \text{ mm (-4,1 mm per side)}$$

Overall Vestis has a movement of: $10 \text{ m} \times 100 \text{ °C} \times 0,0235 \text{ mm/m/°C} = \pm 23 \text{ mm}$ ($\pm 11,75 \text{ mm per side}$)



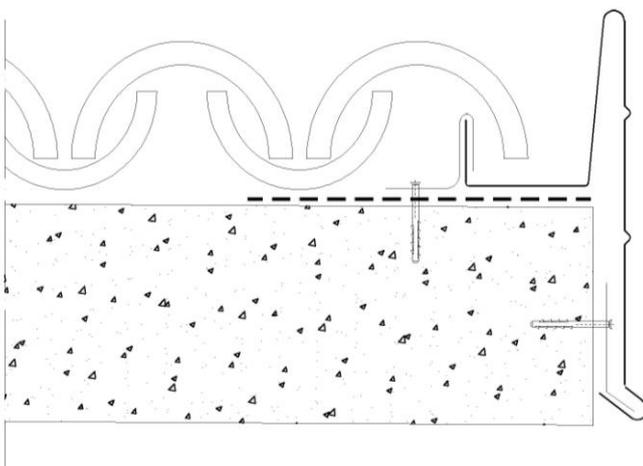
It is important that the installed metal can dilate. Direct fixings can only be used for small elements

WALL COVERING



The drawing alongside shows an excellent solution of indirect fixing, to allow roofing element to dilate. It is important the material is not in direct contact with concrete. To avoid this, use a wooden board or a separating layer

FLASHING



An example of flashing with indirect fixings

Reaction with other metals

In contact with other metals, Vestis may undergo bimetallic corrosion. This phenomenon may begin when aluminium is directly in contact with a different metal. Bimetallic corrosion is more probable in case of “through hole” that happens when Vestis is joined to another metal by a fixing that perforates two layers of different metals.

The two factors that most contribute to rust formation are very severe climate and the difference of chemical potential between the metals. The more aggressive the climate and the greater the difference of chemical potential, the more corrosion will occur. Once this phenomenon has started it tends to worsen over time, and cover more widespread areas. All aluminium alloys are subject to bimetallic corrosion.

While installing roof and façade coverings as well as rainwater drainage elements, it is necessary to avoid the direct contact between two metals with different chemical potential, especially when there is much difference. Usually there can be contact if the finishing works, primarily the installation of gutters and pipes, are made with a different metal from the one used on the roof.

The table shows the reactions by coupling various metals with aluminium. The situation becomes critical if the galvanic coupling is immersed in sea water.

<i>Metal</i>	<i>Bimetallic corrosion</i>
<i>Chrome</i>	<i>Small to negligible</i>
<i>Copper and copper alloys</i>	<i>Serious</i>
<i>Titanium zinc</i>	<i>Negligible</i>
<i>Stainless steel</i>	<i>Negligible (except in marine environments)</i>
<i>Steel and iron</i>	<i>Marked (especially in marine environment)</i>
<i>Tin</i>	<i>Negligible (except in sea water)</i>
<i>Galvanised steel</i>	<i>No effect as long as the zinc layer is not destroyed</i>



If two metals with different chemical potential are in contact, it is necessary to use adhesive strips made of dielectric material (such as low-density polyethylene) to keep the materials separated



Never use copper, copper alloys or iron nuts and bolts, screws, rivets, etc., only stainless steel or aluminium elements should be used in these applications. Fixing elements in the Vestis colours are available on the market.

Never use copper rivets on Vestis

Workability (how to bend Vestis)

Vestis is a very ductile rolled product, and can be bent up to 180°. To prevent any micro-cracking and any damage to the coating, some simple rules must be observed (which are valid for any coated rolled product):

- a) avoid scratching the product with any sharp tools that could mark or cut the coating;
- b) make curved bends, not sharp corners or crushed bends. Make the bends with an internal curved radius of ≥ 1.5 times the thickness (equal to 1.5 T on the ECCA scale) according to UNI EN 485-2 standard.

If, during bending, the coating tears (because it is bent too tightly), the damage will only concern the area being bent and will not extend to the rest of the surface even after a long time.

Indice ECCA*	Schema
0T	 >100
0,5T	 ≈50
1T	 ≈33
1,5T	 ≈25
2T	 ≈20
2,5T	 ≈17

* ECCA: European Coil Coating Association

Vestis rainwater drainage accessories

Any type of metal roofing profile can be made using Vestis, such as gutters, flashings, roof ridges, perforated strips, etc., as long as the bending and installation rules given in this guide are observed.

The gutters can be installed either as suspended elements supported by hooks or as embedded gutters.

It is good practice to make the gutters with a slope of at least 3mm/m with respect to the discharges. Suspended gutters shall be installed so that in case of filling the water can overflow from the most external section.

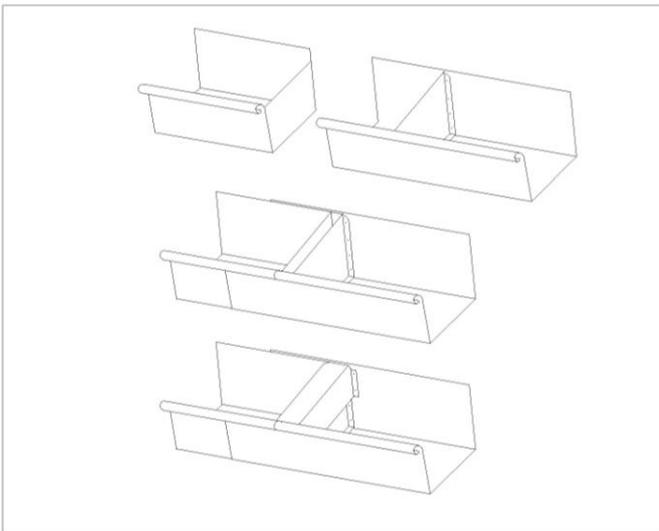
All the joints and fixings must be made so that the corresponding components can expand, shrink or slide without any obstacles to their movement, according to the different temperature ratios and without creating any unsealed points.

	Maximum gutter length in meters	Maximum distance in meters between 2 joints			
		Gutter width < 550 mm		Gutter width > 550 mm	
		Mechanical joint	Elastomeric joint	Mechanical joint	Elastomeric joint
Embedded gutter with 2 free sides	11	11	8,5	8,5	5,5
Embedded gutter with 1 free side	5,5	5,5	4	4	3
Suspended gutter with 2 free sides	15	15	11	11	8,5
Suspended gutter with 1 free side	8,5	8,5	5,5	5,5	4

Expansion joints

There are basically two kinds of expansion joints: mechanical and synthetic rubber (elastomeric) joints.

Mechanical expansion joint



Synthetic rubber (elastomeric) joint



Sealants

Suitable products must be used to seal Vestis rolled products. We recommend the use of neutral linking and low elastic module silicon sealants. These neutral linking sealants have excellent resistance to ageing to the extent that, even in joints that have been working for 20 years, there is no trace of surface micro-cracking or pulverisation, despite the effect of the weather. It is important that during polymerisation no acid or basic substances that could attack the coating develop.

It is of fundamental importance when using these products, to observe the correct application instructions given in the technical sheet or documentation accompanying the product.

In all cases, the surface being sealed must be perfectly clean, free of grease and dry.

Instructions for use

Check the use-by date.

Check the working temperature for the product.

Clean, degrease and dry very carefully the surfaces in contact with the sealant.

Clean the tools: with solvent till the sealant is in a plastic state; mechanically, after hardening.

The sealant beads must be protected from UV-rays, by covering them and keeping them in the shade to lengthen the life of the seal.

Special attention must be paid to storage: silicon cartridges must be stored in a cool dry place. In these conditions, they can be stored for at least 12 months. Any cartridge that has been opened but not completely used can be stored for about 3 months if it is firmly closed.

Maintenance

Vestis does not require any maintenance once installed. In case of industrial environments or large amounts of fine dust that can deposit on the product surface, it can be washed with water and a mild detergent.

Ecology and recyclability

Vestis does not release any harmful or polluting substances into the water and there are no risks for the environment. For the same reason, any discharge water running off Vestis does not dirty walls or floors with oxides, as it usually happens with copper for example.

Aluminium is harmless for flora and fauna, and there is no risk of pollution in the waterways. In fact no legislation limits its use, not even when directly in contact with food and beverages.

Aluminium for roofing or for other building purposes, is completely recyclable and can be re-used in numerous production sectors, maintaining a high market value even as scrap.