

VMZINC® and sustainable building







Making VMZINC® solutions the leading environmental solutions

In a context of increasing collective awareness of the major climate change issues and the potential contribution of the building industry to reducing greenhouse gas emissions, VMZINC® is firmly committed to environmental excellence.

Highlighting the widely recognised environmental qualities of its zinc material (natural, essential character of zinc, excellent level of recycling, moderate quantity of energy required for production) VMZINC® decided to strengthen its commitment alongside its customers by developing a whole palette of solutions to meet sustainable building requirements (zinc roof solutions integrating solar panels, externally insulated facade systems, improved acoustic insulation systems, a variety of surface aspects enabling projects to blend harmoniously with the surrounding environment, etc).

VMZINC® also provides its customers with Environmental Product Declarations complying with national standards that guarantee reliable and recognised environmental information.

VMZINC® has adopted an eco-design approach aiming to reduce the environmental impacts of each new product or solution that it puts on the market. All these initiatives have already yielded concrete results, with a decrease of over 1,000 tonnes of CO₂ equivalent emissions per year!

In the following pages you will discover or rediscover the environmental characteristics of zinc and the environmentally exemplary projects it has been used in and which received recognised sustainable building certifications such as HQE® in France, LEED in the USA, BREEAM in Britain or the Green Star system in Australia.

An invitation to architectural creativity working to preserve our planet.

Christophe Bissery

Director of R&D
and Environmental Applications



Domaine de Cîrè-Blossac Resort et Spa, Bruz (France)
Architect(s) : Atelier Loyer & Brosset Architectes

The environmental characteristics of rolled zinc solutions

Zinc = a natural element

Zinc is naturally present in our environment, with varying levels of concentration. On average, the concentration of zinc in the Earth's crust is 70mg/kg.

Zinc = an essential element

Zinc is vital for all living creatures as it participates in numerous metabolic reactions. In the human body, it is the 3rd most important trace-element after iron and magnesium.



Tools to assess VMZINC® solutions

As part of its commitment to environmental excellence, VMZINC®, has Life Cycle Analysis (LCA) tests conducted on its products and publishes Environmental Product Declarations (EPD) that are available to customers constructing sustainable buildings. Several EPD pertaining to VMZINC® solutions, such as the FDES (French EPD), the BRE Environmental Profiles (British EPD) or the IBU Zertifikats (German EPD), are now available (consult our website).

These analyses provide users of VMZINC® products and systems with comprehensive, reliable and transparent information on the environmental characteristics of the material. They are also used by VMZINC® as the basis for the eco-design approach it has adopted for the development of its solutions.

Life Cycle Analysis

A Life Cycle Analysis (LCA) is a standardised tool used to assess the environmental characteristics of building products.

An LCA starts with an inventory of natural resource consumption (mining and energy resources), substance emissions (into the air, water, soil) and waste produced at each stage of the product's life cycle. The second stage consists of assessing the environmental impacts associated with these flows.

Communication of LCA results is part of the ISO 14025 international standard that leads to the publication of EDP type III.

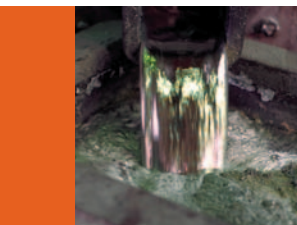


Assessment results in line with expectations > Rolled zinc: an eco-efficient material

With a life span of between 50 and 150 years (depending on type of atmosphere), no maintenance or replacement required over this long period and an exceptional level of recycling (> 95%), in environmental terms, rolled zinc is one of the most efficient materials among the metallic solutions used for building envelopes.

Eco-efficiency

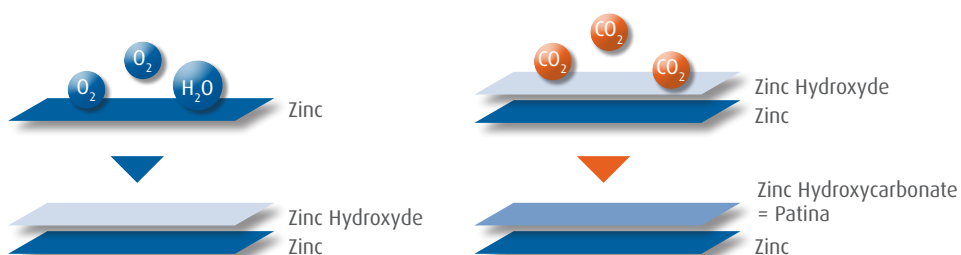
The eco-efficiency of a product is the ratio between "service rendered" (in terms of functionality, life span, maintenance-free, etc.) and the "environmental impacts" relating to its life cycle.



VMZINC® rolled zinc: a durable material

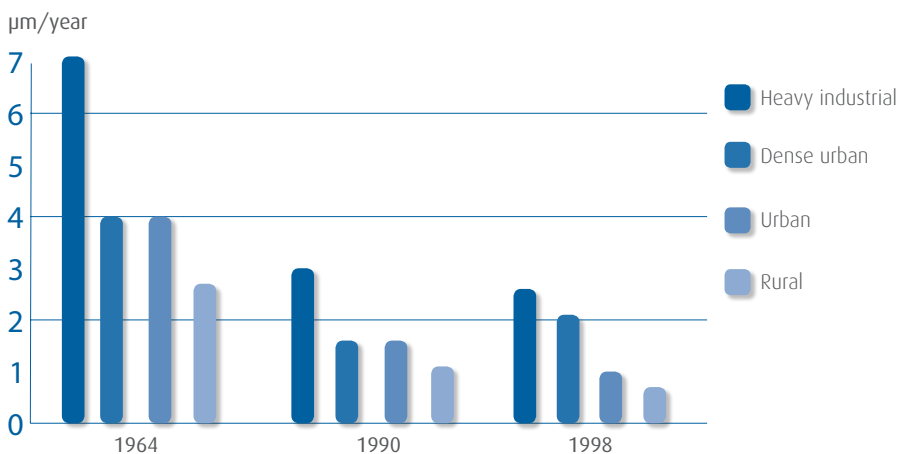
Because of the capacity of zinc to protect itself when it comes into contact with the main components of the atmosphere, the VMZINC® rolled zinc products used in the building industry have a very long life span.

When rolled zinc comes into contact with oxygen, water or carbon dioxide in the atmosphere, a compact coating that is adhesive and not very soluble in rain water forms on the surface of the material. This coating considerably reduces the speed at which the atmosphere's components are diffused in the zinc, and thus reduces the speed of corrosion.



The durability of VMZINC® rolled zinc can be affected by certain atmospheric pollutants that increase the speed of corrosion. The most aggressive of these is sulphur dioxide (SO_2), which is produced essentially by industrial production sites, thermal power plants and road traffic (which explains why the speed of corrosion of rolled zinc can be 4 times higher in an industrial area and twice as high in urban areas than in rural areas).

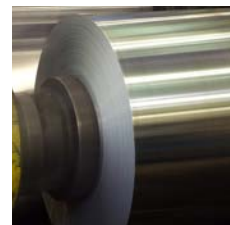
Since the 1970s, European and International legislation has been strengthening measures to fight sulphur dioxide pollution, which has led to a considerable reduction in its concentration and therefore has slowed down the speed of corrosion of rolled zinc.



Corrosion rate evolution

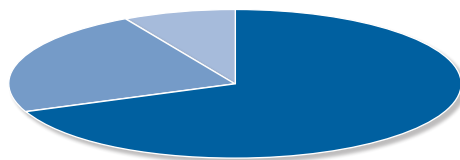


- Today the average speed of corrosion of VMZINC® rolled zinc is 1µm per year. With an initial thickness of 0.7mm and a level of corrosion of 1µm/year, a simple calculation demonstrates that the estimated life span of rolled zinc is over a hundred years. The lifespan of rolled zinc increased over the last 5 years and will continue to increase in the years to come.



VMZINC® rolled zinc: a recyclable material

VMZINC® is 100% recyclable and in Europe 95% is recovered during demolition or renovation work. Old rolled zinc is re-used in different areas of application (secondary fusion of zinc, zinc oxides, brass).



- Secondary fusion of zinc
- Zinc oxides
- Brass

Uses of the old rolled zinc (Rézinal, 2010)

The quantity of rolled zinc recovered every year in Europe is estimated at 100,000 tonnes⁽¹⁾. This represents savings in mining resources estimated at between 1 and 2 million tonnes (zinc content of ore = 5 to 12%).

The success of rolled zinc recycling is due to a very well organised market.

The cathodes of primary zinc used to obtain VMZINC® rolled zinc have a secondary zinc content of 17%⁽²⁾.

⁽¹⁾ « Marché du vieux zinc de toiture » – Umicore Zinc Chemicals, June 2000

⁽²⁾ Nyrstar data

Impact stage

The transport, rolling, installation and lifespan of rolled zinc have a very low impact on the environment. The highest impact stage, regardless of the environmental criteria, is the production of primary zinc from the ore.





**Institut Bauen
und Umwelt e.V.**

> Zinc has low energy consumption and has a very low impact on climate change

Environmental factor	Unit	Manufacturing	Recycling potential	Total Manufacturing and Recycling
Non-regenerative primary energy	MJ	47,58	- 34,19	13,39
Regenerative primary energy	MJ	7,77	- 6,44	1,33
Global warming potential	Kg equiv. CO ₂	3,25	- 2,59	0,65
Ozone depletion potential	Kg equiv. R11	4.11E-07	-2.55E-07	1.56E-07
Acidification potential	Kg equiv. SO ₂	4.25E-02	-2.00E-02	2.25E-02
Eutrophication potential	Kg equiv. PO ₄	5.96E-03	-2.11E-03	3.84E-03
Photochemical ozone creation	Kg equiv. ethane	2.05E-03	-1.05E-03	9.94E-04

Environmental factors for 1 kg of natural rolled zinc from VMZINC® - Extract from the german EPD «Zertifikat IBU»

Results of LCA made on natural rolled zinc from VMZINC®

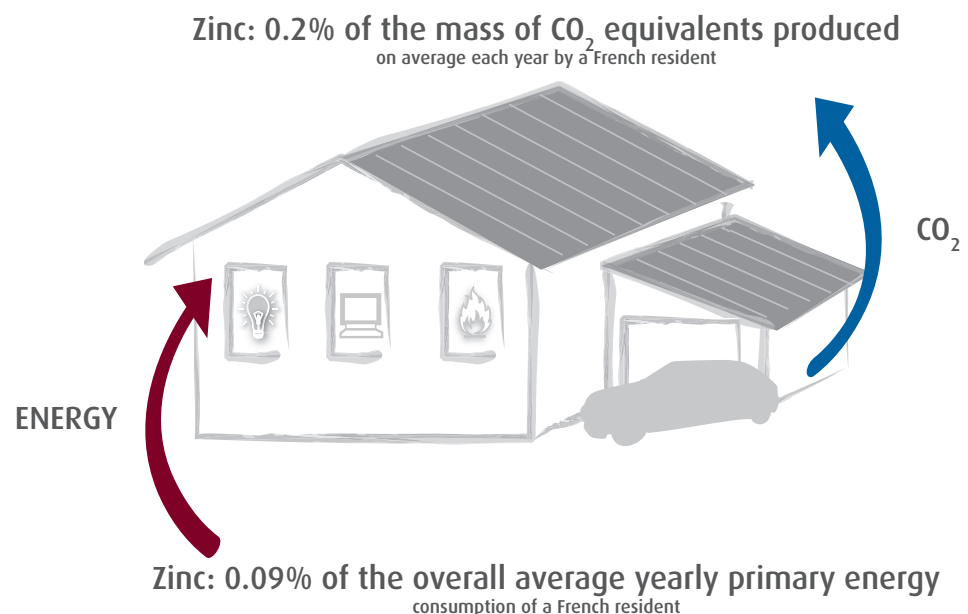
With an energy consumption of 14.7MJ and emissions of 0.65kg CO₂ equivalents for the entire lifespan (including recycling) of 1kg of material, rolled zinc features energy characteristics that are suitable for sustainable building and it contributes to reducing greenhouse gas emissions.

Given that:

- > on average, every year a French citizen consumes 37,517MJ and produces 1,443kg of CO₂ equivalents (Environmental reporting data – PricewaterhouseCoopers),
- > on average, a French citizen can be allocated a surface area of 6m² of rolled zinc each year (typical building using rolled zinc = collective housing with ground floor + 3 storeys containing 28 housing units with on average 3 people per unit),
- > 1 m² of rolled zinc installed using the standing seam technique requires 5.5kg of rolled zinc,

The overall primary energy consumption relating to the average yearly consumption per resident of VMZINC® rolled zinc installed using the standing seam technique is just 0.09% of the overall average yearly primary energy consumption of a French resident,

CO₂ equivalent emissions relating to VMZINC® rolled zinc installed using the standing seam technique are just 0.2% of the mass of CO₂ equivalents produced on average each year by a French resident.



Some of our certifications for environmental performance



The “Haute Qualité Environnementale (HQE)” label in France,
The American “Leadership Energy and Environment Design (LEED)” system,
The Australian “Green Star” system,
The British “BRE Environment Assessment Method (BREEAM)” system,...

These environmental evaluation systems are used in Sustainable Building and can lead to certification. They are also used by architects and clients in the design, building, lifespan and deconstruction of buildings that are increasingly respectful of their users and the environment.

Buildings with zinc envelopes are certified all over the world, demonstrating that VMZINC® solutions can help to obtain recognised Sustainable Building certification.

You will discover some of these buildings in the following pages.

The HQE® approach

The Haute Qualité Environnementale approach is a French method used by architects and their clients.

It aims to improve the environmental and sanitary performance of buildings:

- by controlling the impacts of buildings on the surrounding environment,
- by minimizing the consumption of natural resources,
- and by fitting out safe and comfortable interiors.

It comprises 14 environmental preoccupations called “targets”. These are divided into 4 sub-categories: Eco-building, Eco-management, Comfort and Health.

The transition between urban and rural

The bioclimatic Guy Dolmaire high school, built using the HQE® method, is a striking example of architecture in perfect harmony with the natural and urban landscape of Mirecourt. Its choice of ecological solutions and the use of zinc make it a building that respects the environment and is pleasant to work in.



Main environmental characteristics

The contribution of rolled zinc and VMZINC® solutions to environmental performance

Harmonious blending with the immediate environment

The high school, which blends perfectly into the natural surroundings of Mirecourt, benefited from the local climate and resources (wood industry). The building is south-facing and the atrium provides improved natural light in the entrance hall. On the main facade, large picture windows perpendicular to prevailing winds optimise natural cooling.

Energy

- A “double-skin” envelope with passive solar heating enables a reduction in heating energy consumption of up to 50%
- A heating system made up of a main “wood” boiler with low NOx emissions (P=725kW), and a gas boiler for more specific requirements
- Improved optimisation of additional solar heat and natural light via large picture windows
- Low energy consumption sources of artificial light.

Hygrothermal comfort

To optimise the sanitary quality of the building (in terms of temperature and humidity) and to provide the best possible working conditions for users, the following systems were implemented:

- in winter time, a number of solar gains in the buffer area of the lobby (“double skin” principle) guarantee hygrothermal comfort,
- in summer time, the same level of comfort is maintained thanks to the zinc cladding (parasol effect), the fact that the building faces prevailing summer winds, the 2,000 mobile louvers installed on the facade (natural ventilation) and to the concrete cores that are positioned throughout the building (high level of thermal inertia).



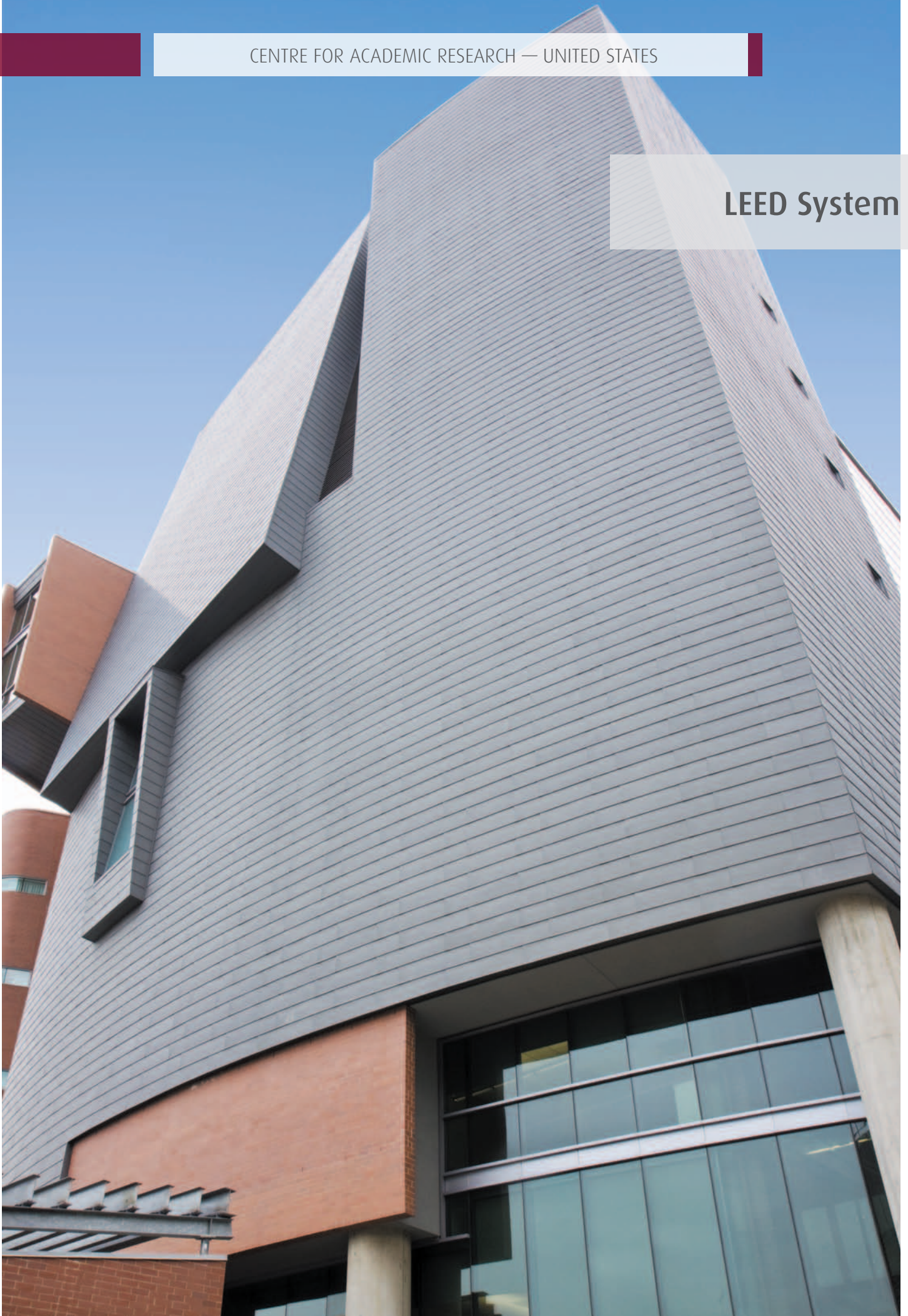
Materials

Rolled zinc was chosen for roofing because of its durability, recycling potential and the fact that it is maintenance-free. The VMZINC® roofing system was selected because it enables the building to blend harmoniously with its surroundings. “The continuous covering of the zinc envelope, with its luminous reflections, blends with the contrasts of the sky”, comments the architectural agency that designed the project. Its other major asset is its contribution to the hygrothermal comfort of users, thanks particularly to the double-skin effect of the envelope.

Double-skin envelope

The double-skin effect means the envelope acts as a “parasol” in summer and a “coat” in winter. The air space between the inner and outer skin creates a thermal buffer area with temperatures similar to indoor temperatures. In winter time, the system’s performance can be optimised with passive solar collectors (e.g. the south-facing glass facade).

LEED System



A building that facilitates communication

The Leadership in Environmental and Energy Design (LEED) is a North-American system for the environmental evaluation of buildings. It is the most widely used system in the world and the model on which most new systems are based.

The first level of evaluation focuses on the 3 Rs:

- Reduction of waste and resources used
- Re-utilisation of materials
- Recycling of materials

The LEED system then evaluates projects according to 6 main categories: Ecological development of sites, Water, Energy, Materials and resources, Quality of interior environment, Innovation and design process. The evaluation can lead to 4 levels of performance: certified, silver, gold or platinum.

The new Centre for Academic Research (CARE) at the University of Cincinnati houses some of the most technically advanced laboratories and teaching spaces in the United States. Between the existing Medical Science Building (MSB) and the new CARE, over 237,000m² of space designated for collaboration between researchers and students facilitates socialising and collegiality. According to Lou Hartman, project manager with Harley Ellis Devereaux, "the University and the design team wanted to create an architecturally striking building that would stimulate innovative thinking, academic collaboration and scientific breakthroughs by researchers and students". This building obtained the LEED certification gold level.

Main environmental characteristics

Ecological development of the site

- Construction of a bicycle garage
- 5% of parking spaces reserved for electric cars or cars with low greenhouse gas emissions
- Development of planted surfaces to optimise management of rain water

Materials

- 95% of site waste, including VMZINC® rolled zinc was recovered and made available for recycling (43,900 tonnes)
- 41% of construction products used was made using recycled material
- 78% of construction products used was produced locally (less than 800km from the site)
- 53% of wood materials used came from sustainably managed forests

Quality of interior environment

- System for controlling carbon dioxide content (CO₂)
- System for controlling the content of pollutants and various chemical substances in internal air
- 13 filtration systems incorporated in the ventilation system
- Choice of materials without (or emitting a low level of) Volatile Organic Compounds
- System for controlling the hygrothermal stability of internal air

Energy

- Natural cooling ventilation system
- Bay windows to ventilate the atrium
- Natural lighting for 75% of areas
- Automatic equipment to control artificial lighting in classrooms and laboratories
- Energy management equipment in laboratories
- "White" roofing to reduce the "heat island" effect

Water

- Recovery of rain water

Communication

- Provision of a manual on best eco-responsible practises for site users and visitors

Heat island

An urban "heat island" is a metropolitan district that is significantly hotter than the surrounding rural areas. Generally speaking, the difference in temperature is bigger at night and when winds are low. The main cause of urban heat islands is a modification to the surface of the earth due to significant urban development using materials that store heat.



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A model for eco-responsible construction

The “Nordheim Court” student halls of residence at the University of Washington feature a modern design with a palette of contemporary colours (grey, ochre, sandy, pale green). The building was designed around the strong points of the site: a body of water, south facing orientation and access to the “Burke Gilman” train station.

The eight buildings, which house 460 beds, are organised around a central square.

Main environmental characteristics

Ecological development of the site

- Retention of the body of water
- Retention of sixty year old trees
- Optimisation of south facing orientation

Materials

- 81% of site waste (boxes, concrete, VMZINC® rolled zinc and other materials, wood) were recovered and made available for recycling
- 35% of building products used were made using recycled materials
- 55% of building products used were produced locally (less than 800km away)
- 43% of cement used in concrete was replaced by pulverized fuel ash

Quality of internal air

- High performance Heating, Ventilation and Air Conditioning system
- 14 filtration systems incorporated into the ventilation system
- Materials without (or emitting a low level of) Volatile Organic Compounds

Energy

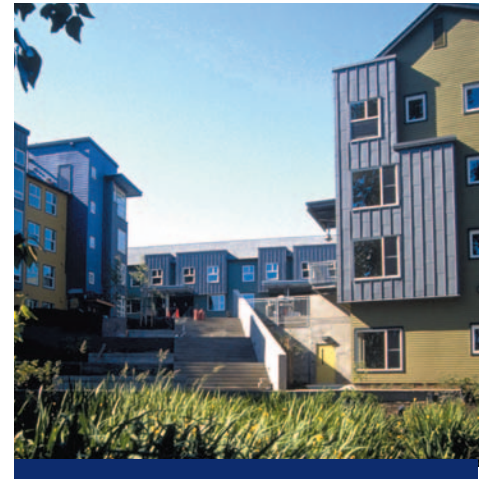
- Passive solar design
- High performance insulation
- Automated systems
- Solar water heaters

Transport

- Large bicycle garage
- Electric refuelling station to promote the use of electric cars that do not emit greenhouse gases

Communication

- Provision of a manual on best eco-responsible practises for site users and visitors



Nordheim Court in a few figures...

An eco-responsible site model with optimised costs: 81% of building products recovered and recycled means 589 tonnes of building waste to supply various sectors of reutilisation and 14,582\$ of savings.



VMZINC® rolled zinc as the obvious choice

Abergwynfi primary school, located near Neath in the United Kingdom, features a futuristic design that is characterized by a continuous circular line of 8 buildings, all with zinc roofs that are perfect for this architectural concept.

This primary school was awarded the “Excellent” BREEAM certification.

When asked what were the reasons behind his choice of building products, Jonathan Morris, chief architect at Neath Port Talbot town hall replied “We chose VMZINC® rolled zinc because of its recyclability and guaranteed performance. The gradual formation of a natural auto-protective coating also meant the roofing would require no maintenance.”

Main environmental characteristics

Materials

- Re-utilisation of materials after demolition of the old buildings on the site
- Use of VMZINC® rolled zinc for its durability, its recyclability and its capacity to form a self-protective coating that makes it maintenance-free

Comfort and safety

- **Managing risk of mould:**
 - use of a vapour-barrier with two types of insulation and a water-tight membrane
 - the windows in the roofs open automatically when an increase in temperature or carbon dioxide content is detected
- **Acoustic comfort:**
 - use of highly effective acoustic insulation between work spaces
 - use of acoustic insulation keeping sound reverberation to a minimum in teaching and study areas

The BREEAM (BRE Environmental Assessment Method) is the system used in Britain to evaluate sustainable building. This system is based on the management and assessment of 8 areas of environmental impact: Management, Comfort and safety, Energy, Transport, Water, Materials and waste, Site management and ecology and Pollution. A building assessed using this system can be awarded one of five levels of performance: Acceptable, Satisfactory, Very satisfactory, Excellent and Exceptional.



Patina

When VMZINC® rolled zinc comes into contact with the atmosphere it reacts to the main atmospheric components (water, oxygen and carbon dioxide) by forming a compact, adhesive coating on its surface that is not very water soluble and makes it extremely durable and maintenance-free.

BREEAM

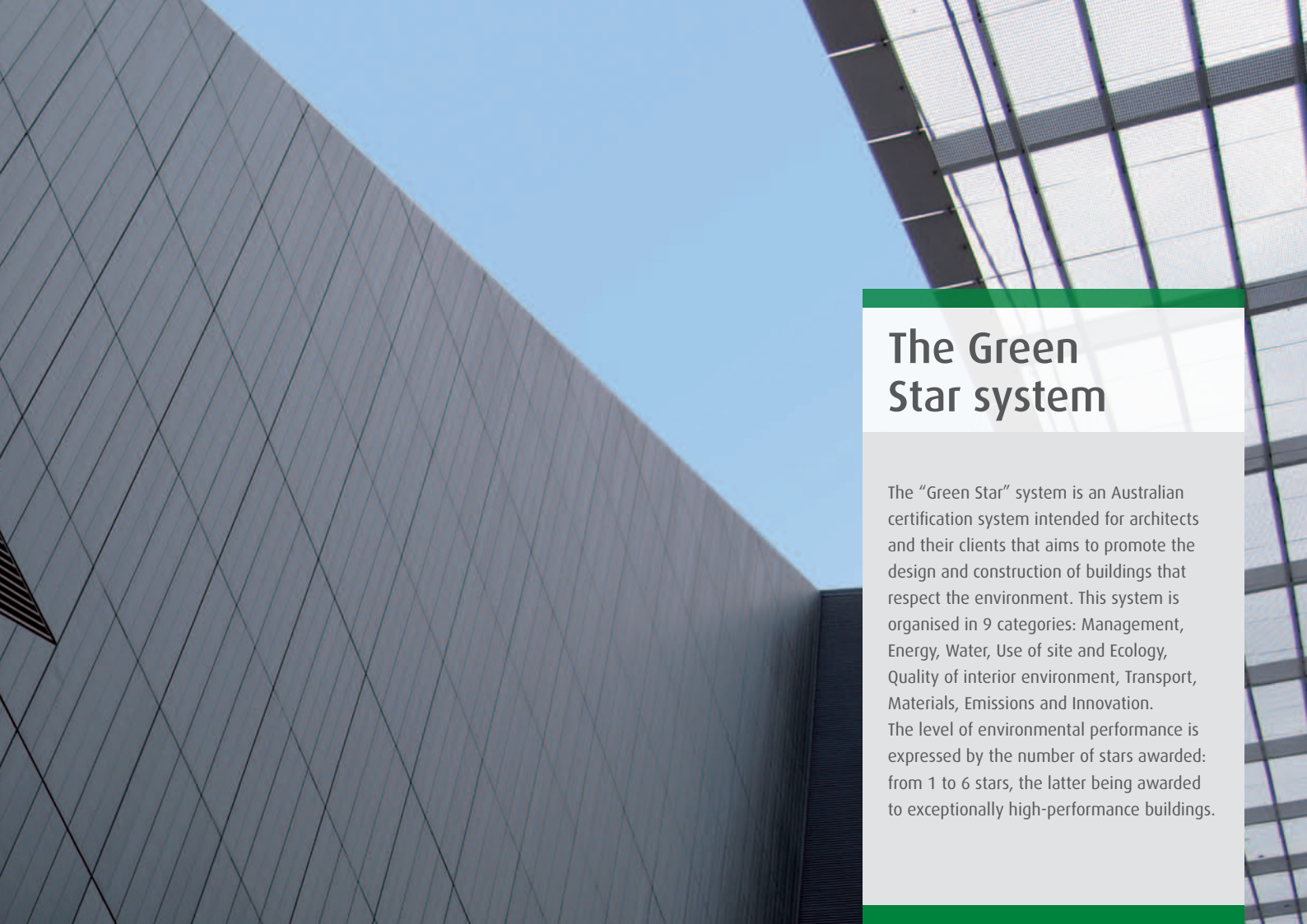


An example for sustainable building

With its “6 stars”, the Melbourne exhibition centre is the first exhibition centre in the world to obtain the highest level “Green Star” certification for environmental design and construction.

This building in fact won first prize in the “Public Building and urban design” category at the Australian “BPN Sustainability Awards”. During the awards ceremony, the jury said of the project: “It led to highly positive decisions on urban design by including improved connectivity and did not resort to the typical “black box” design for exhibition centres.” An 18m glass facade provides the exhibition centre with abundant natural light and an impressive view of the Yarra river and the rooftops of Melbourne.

The bottom section of the page features a photograph of the same building, showing a different angle of its dark, angular facade and large glass windows. The building's design is characterized by sharp lines and a complex, geometric structure. The photograph is set against a white background.



The Green Star system

The “Green Star” system is an Australian certification system intended for architects and their clients that aims to promote the design and construction of buildings that respect the environment. This system is organised in 9 categories: Management, Energy, Water, Use of site and Ecology, Quality of interior environment, Transport, Materials, Emissions and Innovation. The level of environmental performance is expressed by the number of stars awarded: from 1 to 6 stars, the latter being awarded to exceptionally high-performance buildings.

Main environmental characteristics

Energy

- Efficient ventilation: very high level of air quality for a low level of energy consumption
- 18m long glass facade: reduction in the use of artificial light and reduction of heating requirements in winter
- Solar thermal systems for heating water: 40% saving on water heating
- Optimised natural lighting
- Artificial lighting partially automated and with low energy consumption

Water

- Waste water and rain water treatment plant, with re-utilisation of treated water for toilets, watering gardens and cooling tower
- Optimized functioning of interior equipment and fittings for water systems

Quality of internal air

- Under-floor heating and cooling: high level of hygrothermal comfort
- Appliances for measuring carbon dioxide content incorporated into the air conditioning system
- Interior materials with low level of Volatile Organic Compound emission

Materials

- Use of wood from sustainably managed forests (Forest Stewardship Council)
- Use of sustainable materials and equipment such as VMZINC® solutions
- Replacement of PVC by more sustainable materials



Volatile Organic Compounds

Volatile Organic Compounds are substances belonging to different chemical families all of which evaporate at room temperature.

Among these we find benzene, styrene, toluene and trichloroethylene, but also formaldehydes and acetyls.

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