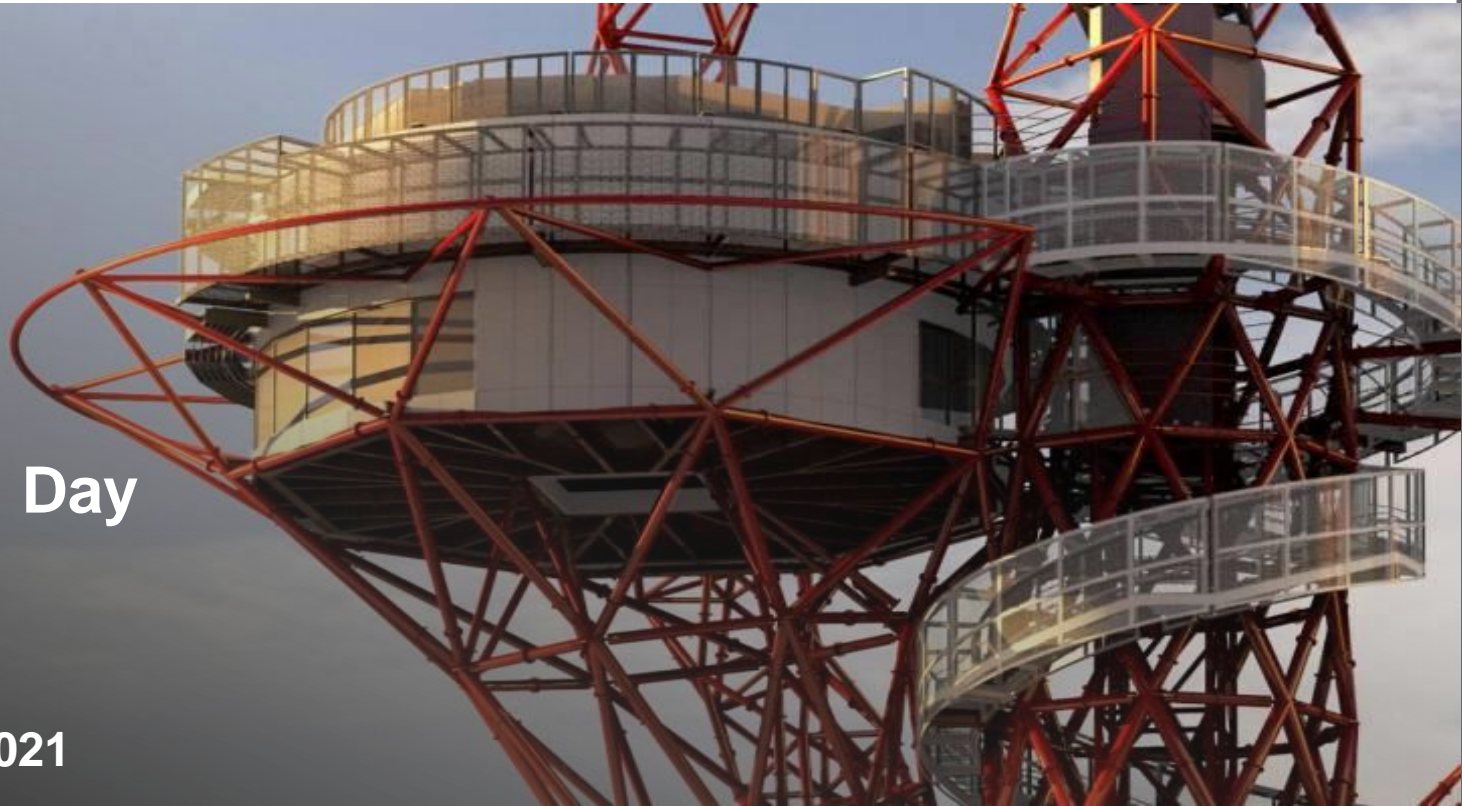


Magnelis® for façades ... and more !



Danish Steel Day

Jérôme GUTH

November 11th 2021

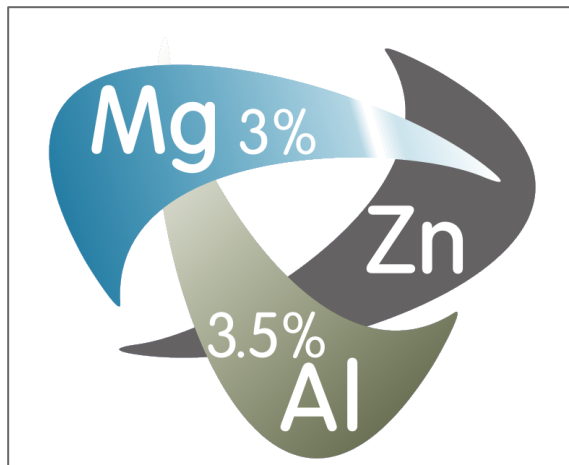
Magnelis® launched 10 years ago for demanding environments & applications and to offer longer lifetimes



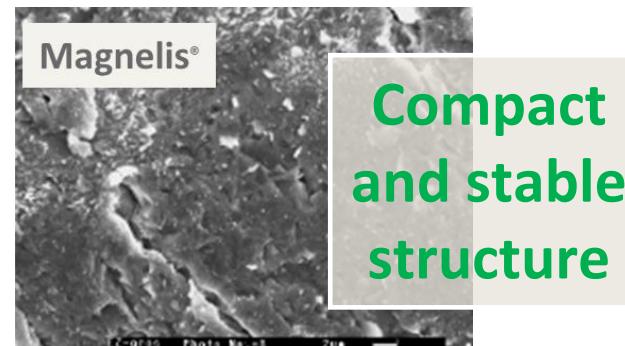
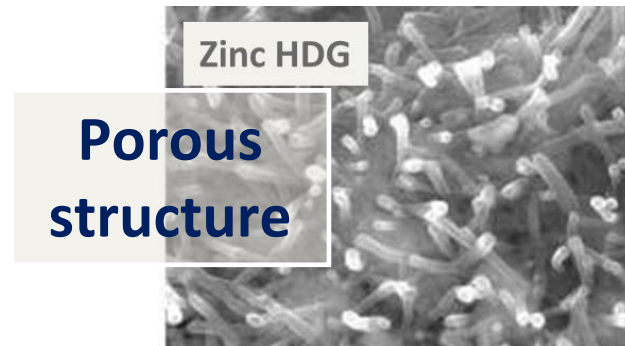
ArcelorMittal



Continuous process
Automated
On-line control



A unique composition
A full range of grades
And thicknesses



Specific corrosion products

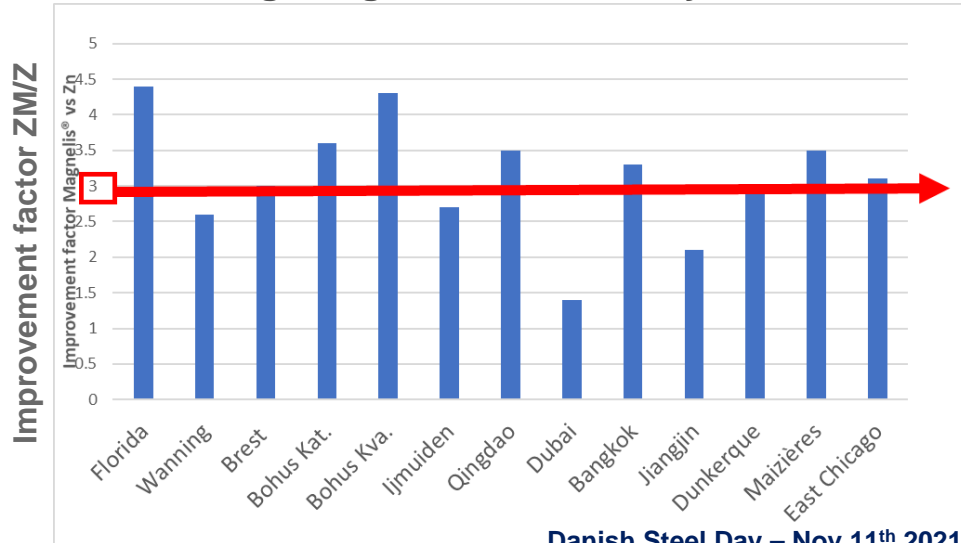
Large scale atmospheric testing around the world demonstrates the lower corrosion rate of Magnelis®



ArcelorMittal



Average improvement ratio of Magnelis® vs regular galvanised after 6 years



Magnelis® exhibits lower corrosion rates.

Average improvement:
x 3 compared to regular galvanised steel

Magnelis® performances are certified by third parties



ArcelorMittal

CSTB
France

Direction Enveloppe, Isolation et Sols
Institut Français de Construction et de Sols

EVALUATION TECHNIQUE DE PRODUITS ET MATERIAUX
N° 20/0907 du 3 février 2020
concernant le produit de revêtement métallique sur tôle
de acier
« **MAGNELIS®** »

Authorised by ArcelorMittal Europe - Flat Products
Approved by CSTB

Authorised by ArcelorMittal Europe - Flat Products
Approved by CSTB

Other Evaluation Technique compatible & copies. No reproduction of this document may be made without the prior written permission of the author.

RISE
Sweden

Type Approval and decision
on production control
C900227

Magnelis ZM310, Corrosion protection

Authorised by ArcelorMittal Europe - Flat Products
Approved by RISE

Authorised by ArcelorMittal Europe - Flat Products
Approved by RISE

Other Evaluation Technique compatible & copies. No reproduction of this document may be made without the prior written permission of the author.

DIBT
Germany

Allgemeine
baufachliche
Zulassung

Authorised by ArcelorMittal Europe - Flat Products
Approved by DIBT

Authorised by ArcelorMittal Europe - Flat Products
Approved by DIBT

Other Evaluation Technique compatible & copies. No reproduction of this document may be made without the prior written permission of the author.

SCI
United Kingdom

Review of Magnelis® coating
performance as corrosion
protection

Authorised by ArcelorMittal Europe - Flat Products
Approved by SCI

Authorised by ArcelorMittal Europe - Flat Products
Approved by SCI

Other Evaluation Technique compatible & copies. No reproduction of this document may be made without the prior written permission of the author.

RISE
Sweden

Type Approval and decision
on production control
C900227

Steel flat products for cold forming coated
with Magnelis® ZM120

Authorised by ArcelorMittal Europe - Flat Products
Approved by RISE

Authorised by ArcelorMittal Europe - Flat Products
Approved by RISE

Other Evaluation Technique compatible & copies. No reproduction of this document may be made without the prior written permission of the author.

NEW

NEW

Expected lifetimes & edge protection (DiBt)

Magnelis® ZM310
possible use in **C5**
corrosion category
with 15 years of
expected lifetime

Überzug	Erwartete Schutzdauer in Jahren ¹⁾ bei Exposition in Korrosivitätskategorie nach DIN 55634-1 ⁴			
	C2	C3	C4	C5-M
Magnelis® ZM120	24 bis > 50	8 bis 24	6 bis 12	- ²⁾
Magnelis® ZM250	≥ 50	17 bis 50	13 bis 25	6 bis 13
Magnelis® ZM310	> 50	21 bis > 50	16 bis 31	8 bis 16
Magnelis® ZM430	> 50	29 bis > 50	22 bis 43	11 bis 22

¹⁾ anhand der in Versuchen ermittelten Abtragsgrenzen berechnete Schutzdauer
²⁾ Anwendung nicht empfohlen

Magnelis® ZM120
is at least
equivalent to Z275

Magnelis® ZM120
possible use in **C4**
corrosion category
with 15 years of
expected lifetime

All certificates available online

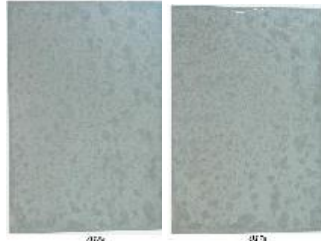
© ArcelorMittal 2017 - All rights reserved for all countries. Cannot be disclosed, used, or reproduced without prior written specific authorization by ArcelorMittal. CONFIDENTIAL - Privileged information - ArcelorMittal proprietary information

Magnelis® and Zn, Al, Mg alloyed coatings exhibit slow darkening over time, depending on outdoor conditions

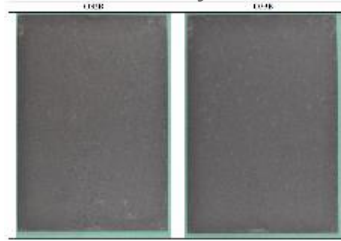
Magnelis®



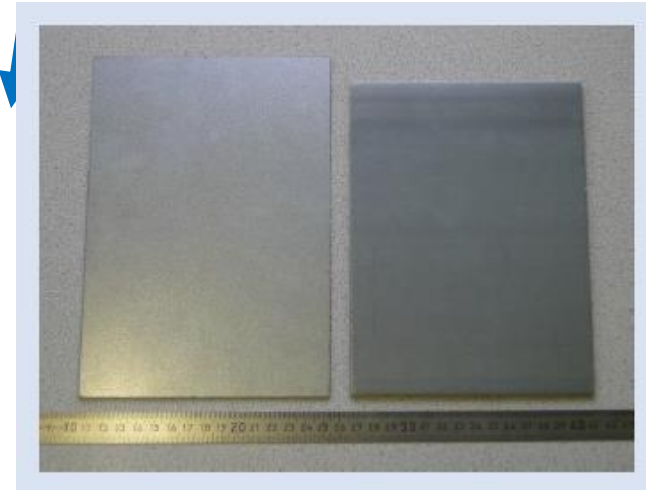
after 6 month



after 4 years



Other ZM coating



Magnelis®, like all other ZM coatings, is subjected to darkening of the surface over time. This patinated / mat aspect, already visible after six months, gives a rustic, discrete and traditional feel. The speed of patination will depend on the local environment.

Easyfilm® on Magnelis®

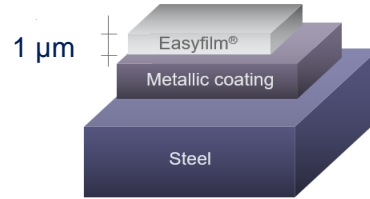
→ stabilize the aspect + avoid fingerprint stains



ArcelorMittal

Magnelis® + Easyfilm® fresh

Magnelis® + Easyfilm® aged



On-line application of thin organic coating



Finger print on Magnelis

Magnelis® + Easyfilm®

Magnelis® + E-Passivation®

Magnelis® for facade panels

→ Maison de la culture – Namur / Belgium



ArcelorMittal

Le Delta: La Maison de la culture de la province de Namur renaît

Façades avec de l'acier Magnelis

Le bâtiment construit au début des années 60 a bénéficié d'une rénovation et de plusieurs extensions, dont la spectaculaire salle 'Tambour'. Le Magnelis a été utilisé en contraste avec les façades en bambou pour réaliser les cassettes abritant les stores relevés mais surtout de grandes vantelles verticales orientables qui protègent du soleil la façade ouest. Une tôle 'sur mesure' perforée à 71% a été utilisée pour tous les garde-corps en acier galvanisé de 2 mm d'épaisseur. Le 'Tambour' repose sur une unique colonne centrale en acier Ø 300 mm et 12 bras en acier AE355 (355 N/mm²), 7 colonnes périphériques Ø 150 mm étant placées pour répondre aux cas de charges dissymétriques. Les qualités de l'acier sont aussi exploitées e.a. dans les grills techniques des différentes salles et dans une cage d'escaliers où ceux-ci sont supportés par des cadres en tôles de 2 mm avec le motif 'sur mesure' sans aucuns tirants diagonaux de contreventement, tous les efforts étant contenus par la tôle.



© Projet: SAMYN and PARTNERS - Photo: François Brix

Magnelis® for facade panels

→ Maison de la culture – Namur / Belgium



ArcelorMittal



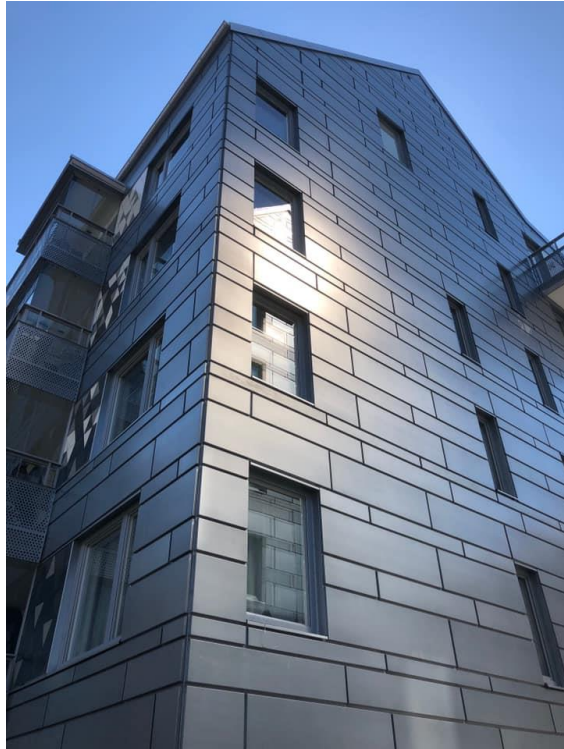
<https://samynandpartners.com/fr/portfolio/628-maison-de-la-culture-de-la-province-de-namur/>

© Projet: SAMYN and PARTNERS - Photos: François Brix

Magnelis® for cassettes
→ Residential building -- Vasteras / Sweden



ArcelorMittal



Fassade cassettes – Magnelis® ZM310

Magnelis® for profiled panels

→ Industrial building – Stockholm Harbor



ArcelorMittal



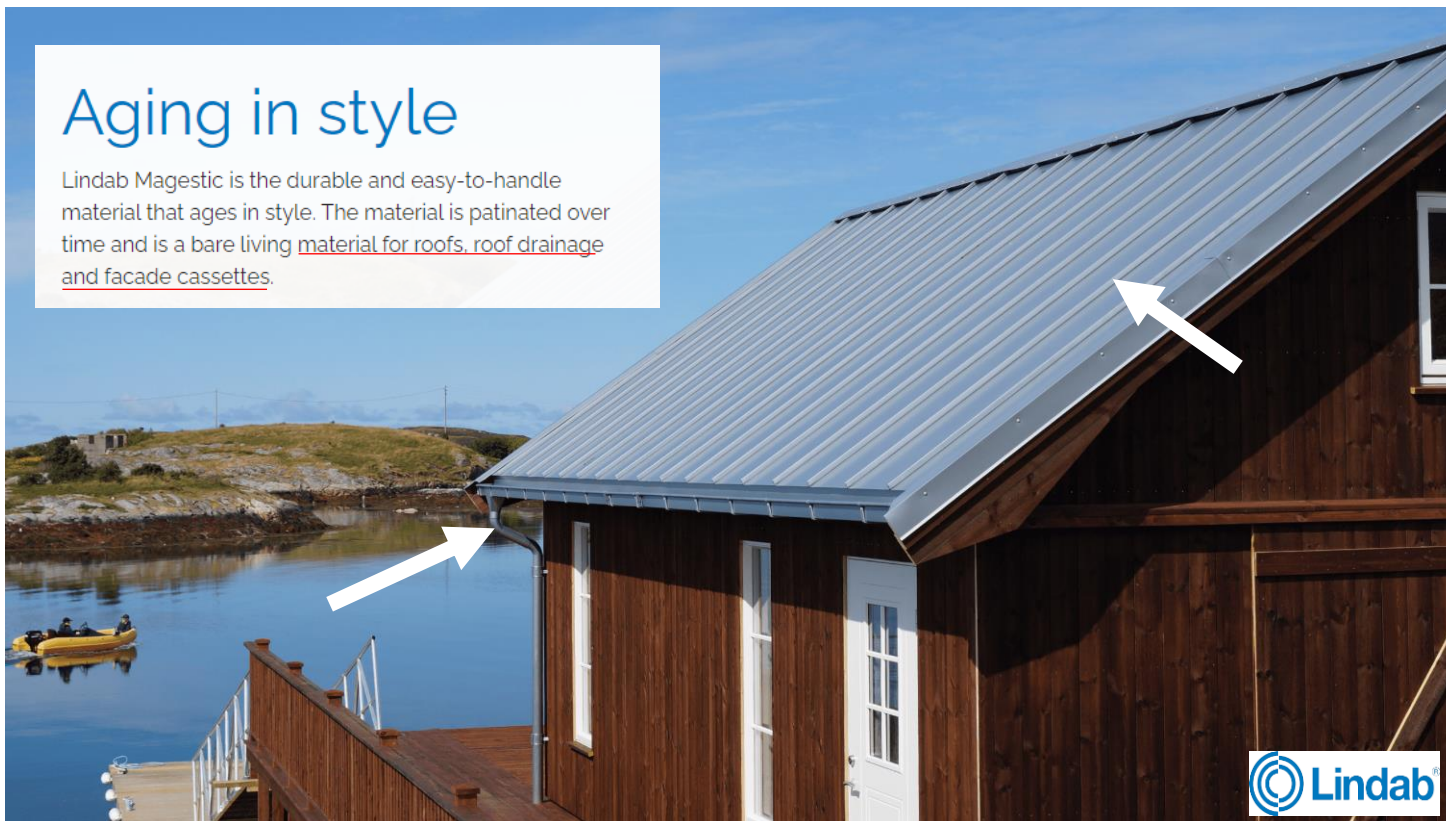
Magnelis® for standing seam roofs & drainage systems



ArcelorMittal

Aging in style

Lindab Magestic is the durable and easy-to-handle material that ages in style. The material is patinated over time and is a bare living [material for roofs, roof drainage and facade cassettes](#).



<https://www.lindab.se/losningar/byggkomponenter/platslagerimaterial/magestic/>

Danish Steel Day – Nov 11th 2021

Magnelis® for standing seam roofs



ArcelorMittal



Johan Cronhamn,
business area manager,
BEVEGO



Magnelis® – the new material for standing seams

BEVEGO has been working with a sister company to develop roadside safety equipment with Magnelis® coated steels.

From autumn 2021 BEVEGO will start to use Magnelis® for standing seam roofs. **“Architects like the patina that darkens over time, and Magnelis® has minimal reflectivity, making it suitable for low buildings,”** says Johan Cronhamn.

“In roofing applications we will use it in a thickness of 0.6 mm. That will provide the material flexibility roofers need, and **long-term protection against corrosion.**”

Read the full article on-line

*Standing seam roofs are traditionally made on site using long strips of metal
[Copyright: brizmaker / Adobe Stock, by courtesy of **Bevego**]*

Magnelis® for roof safety systems (snow barriers & fences - roof walkways, steps & ladders)



ArcelorMittal

walkway



Snow fence



Roof step



Snow barrier

Corrosion protection

We are in the forefront of product development in the industry.

In 2011, CW Lundberg AB began working with Zinc-Magnesium, a new surface treatment for steel sheet metal that was introduced onto the market. This surface treatment replaces traditional hot galvanisation and is a considerably more environmentally friendly and corrosion resistant alternative.

We can proudly state that in 2016, all our products will be made of Zinc-Magnesium and that no products will be welded.

Advantages of Zinc-Magnesium compared with hot galvanised steel

- Up to ten times better corrosion resistance.
- Corrosivity class C5 for 20 years.
- Lower environmental impact thanks to a 75% lower zinc content and up to 75% slower zinc run-off rate.

Magnelis® for roof top solar structures (hooks, rails or wind deflectors)



**STURDY AND SUSTAINABLE
RESISTANT AGAINST CORROSION**

ClickFit EVO tiled roof is made of high-quality aluminium and Magnelis coated steel. This steel type has a longer lifespan, is highly resistant to corrosion and features a self-healing coating.

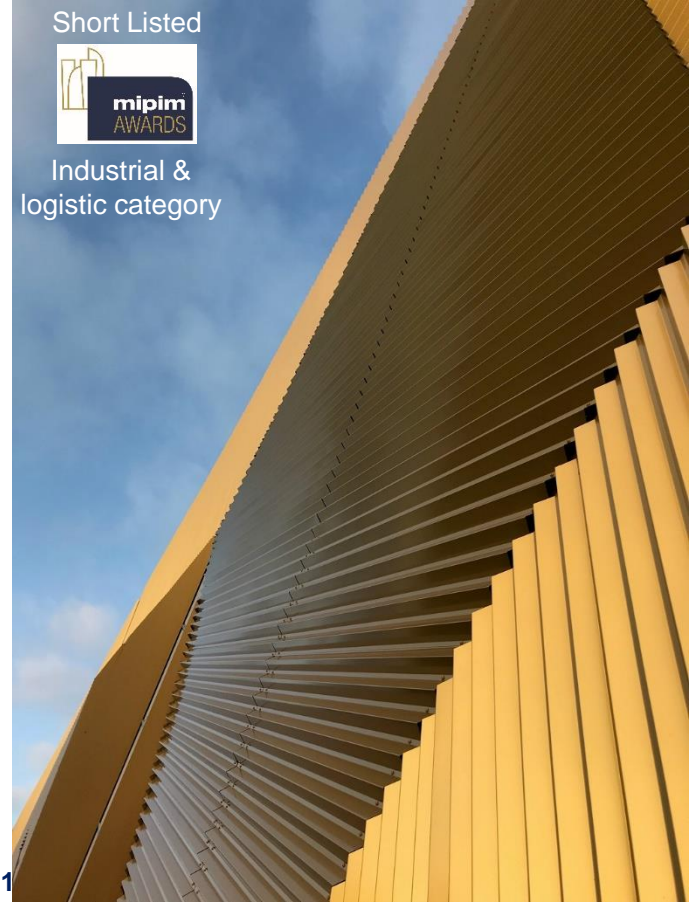
- ✓ High-grade aluminium and Magnelis coated steel
- ✓ Longer lifespan
- ✓ Resistant to corrosion
- ✓ Self-healing coating



Magnelis® for facade supporting structures → The Royal Dutch Mint – Houten / The Netherlands



ArcelorMittal



Wastiau & Co and Wil-Ma, a collaboration of two architectural firms from Belgium, designed a functional building with a spectacular outer skin made from high-gloss **Granite® Silky Shine** from ArcelorMittal Europe – Flat Products.

Copyright images: Pawel Knebel, LT Photography, Wastiau & Co and Wil-Ma (photographer: Wim Carens), and ArcelorMittal

Magnelis® for facade supporting structures

→ The Royal Dutch Mint – Houten / The Netherlands



Understructure made of profiled rails in Magnelis® coated steel

Magnelis® for facades supporting structures: All Weather Terminal at ArcelorMittal Ghent



ArcelorMittal



Magnelis® et Granite® HDX

3.200 tonnes d'acier ont été utilisées pour la construction de l'entrepôt et du hall de quai de l'All Weather Terminal. Le bardage de façade sur la structure de base se compose de caissons intérieurs pour façades à double paroi de type 90/500, version Magnelis® ZM310, qui



Magnelis® for facades supporting structures → Renovation & insulation



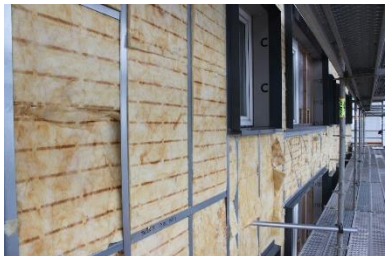
ArcelorMittal



Magnelis® for facades supporting structures → Renovation & insulation



ArcelorMittal



Surface treatment and corrosion class Triplan steel sections

Danish Steel Day – Nov 11th 2021

Significant reduction of corrosion rates vs batch galvanisation with a more stable behaviour

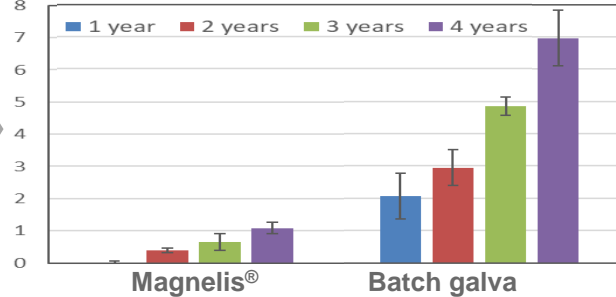


ArcelorMittal

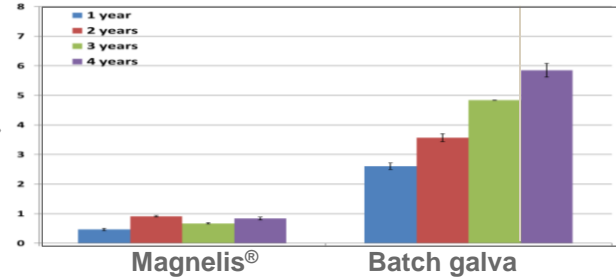


19

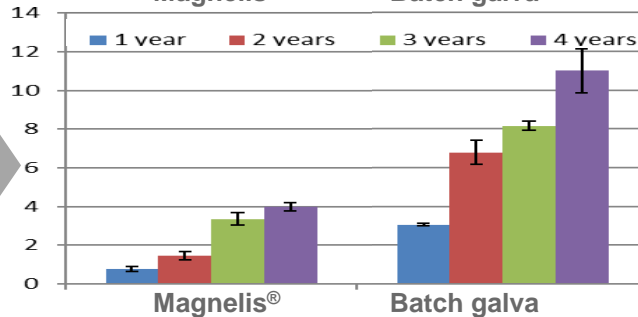
Average coating consumption (μm)



Improvement factor 7,0 over 4 years.



Improvement factor 5,4 over 5 years.



Improvement factor 2,8 over 4 years.

Others testing fields for specific harsh environments



Magnelis® exhibits a specific self healing effect, protecting cut-edges



6 months

1 year

2 years

4 years

5 years

7 years

10 years

Magnelis®

Al₅₅Zn₄₅

Galva

The kinetics of the self healing effect depends on **local climatic conditions**

10 years exposure at Brest test center

Samples with a dense perforation rate on 2 mm steel coated with Magnelis® 20 µm



Magnelis® for ventilated facade fastening systems



ArcelorMittal



Advantages of Using Magnelis Brackets

- Excellent corrosion resistance (C5 corrosion category) atmospheres, high humidity, and high salinity
- Self-healing effect ensures excellent edge protection
- Proven A1 fire resistance
- Very low thermal conductivity
- Excellent processing properties
- Environmentally-friendly manufacture process



Ventilated façade fastening systems, insulating fastenings, ETAG 034 (ags.org.pl)

Danish Steel Day – Nov 11th 2021

Life Cycle Analysis: from a voluntary to a regulatory approach in Europe to select materials

Magnelis®

ENVIRONMENTAL PRODUCT DECLARATION
as per ISO 14025 and EN 15804

Owner of the Declaration: ArcelorMittal Europe – Flat Products
 Programme holder: Institut Bauen und Umwelt e.V. (IBU)
 Publisher: Institut Bauen und Umwelt e.V. (IBU)
 Declaration number: EPD-ARM-20170140-IBU 1-EN
 ECO EPD Ref. No.: ECO-00003926
 Issue date: 25/01/2019
 Valid to: 24/01/2024

Hot dip galvanized steel with Magnelis® coating
ArcelorMittal






Global Warming Potential (GWP) in kg CO₂/tonne

Modules A1-A3 (product stage):
2570 kg CO₂/t

Module C3 (waste processing):
2.0 kg CO₂/t

Module D (recycling):
-1710 kg CO₂/t

Building Life Cycle Information (EN15978:2011)														
Production			Construction		Use					End of life				Beyond life
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacturing	Transport	Construction – Installation process	Use	Maintenance	Repair	Refurbishment	Replacement	Demolition	Transport	Waste processing	Disposal	Reuse – Recovery – Recycling potential
					B6 Operational energy use									
					B7 Operational water use									

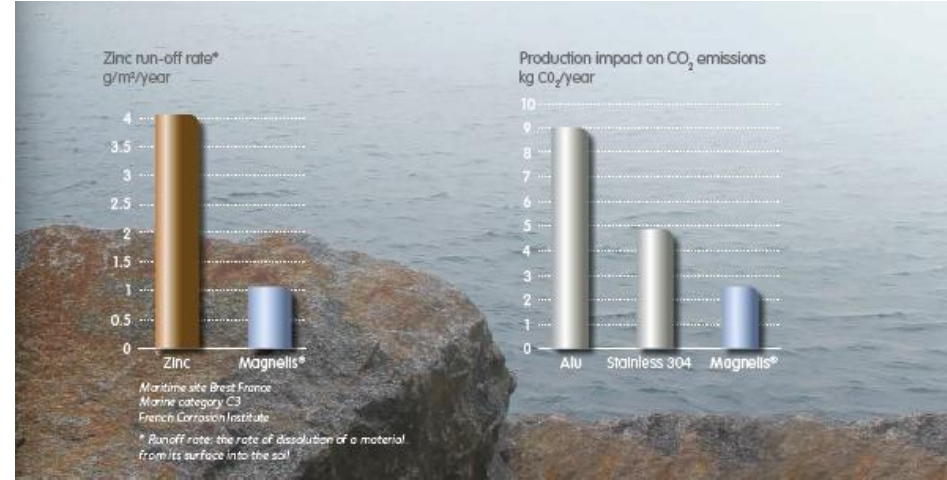
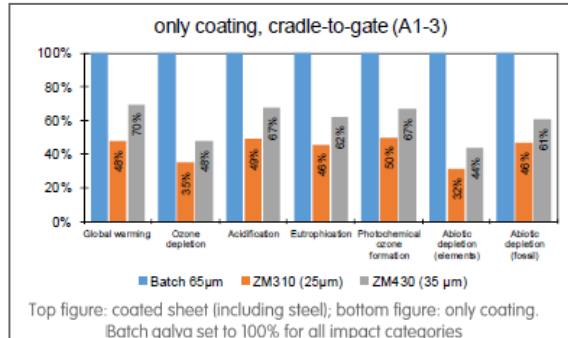
Some countries now moving forward for construction:

- e.g. France, The Netherlands, Sweden, Finland....
- Start with residential: individual small collective
- Extend to public, commercial & industrial buildings,
- Different approaches: LCA part of permitting process, valorization of CO₂ footprint, ...
- Consequence: data required → EPD
- Question: EPD data: from declarative to commitment

Magnelis® contributes to reducing the environmental impact of building

1. Material Environmental Product Declaration (EPD) is available online to perform Life Cycle Analysis
2. At equivalent protection, Magnelis® uses less resources (Zn) & energy in comparison to continuous or batch galvanised steels.

Lower CO₂ footprint of Magnelis vs Batch Galv At equivalent protection



1. Magnelis® reduces significantly zinc runoff in soils and waters (e.g water reserve areas)

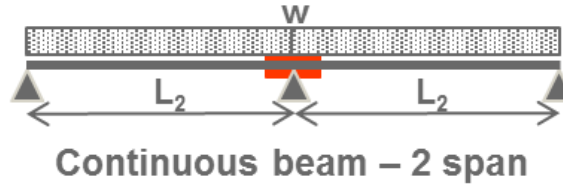


2. Magnelis® reduces the CO₂ footprint compared to stainless and Aluminium

Light weight design for CO₂ footprint reduction! thanks to Higher Strength Steel ...compatible with Magnelis®



ArcelorMittal



S350GD+ZM (reference)	S450GD-HyPer+ZM	S550GD-HyPer+ZM
Height: 350 mm Thickness: 2,50 mm Weight: 11,88 kg/m Yield strength: 350 MPa	Height: 350 mm Thickness: 2,30 mm Weight: 10,93 kg/m Yield strength: 450 MPa	Height: 350 mm Thickness: 2,15 mm Weight: 10,22 kg/m Yield strength: 550 MPa
Span: 6 m Bearing load: equivalent	Span: 6 m Bearing load: equivalent	Span: 6 m Bearing load: equivalent
Global Warming Potential 10,3 kgCO ₂ eq/m	Global Warming Potential 9,51 kgCO ₂ eq/m	Global Warming Potential 8,89 kgCO ₂ eq/m
→ Reference	→ - 8%	→ -14%

Our targets and ambition to get to net- zero



Group-wide 2050
net-zero target



Europe: 35% CO₂
emissions reduction
by 2030



Many decarbonisation
projects underway across
our European operations

AM signed a MOU with Spain for a 1 Billion € investment that will allow AM Sestao to become the first full-scale zero carbon-emissions steel plant by 2025

13 July 2021 13:45 CET

ArcelorMittal signs MoU with the Spanish Government supporting €1 billion investment in decarbonisation technologies

The Gijón DRI will also feed the company's Sestao plant, situated approximately 250km from Gijón, where production is already entirely from the electric arc furnace route. This means that by 2025 ArcelorMittal Sestao will produce 1.6 million tonnes of steel and be the world's first full-scale steel plant to achieve zero carbon-emissions.

At the heart of the plan is a 2.3 million-tonne green hydrogen direct reduced iron (DRI) unit, complemented by a 1.1 million-tonne hybrid electric arc furnace (EAF). This starts the transition of the Gijón plant away from the blast furnace-basic oxygen furnace steelmaking production route to the DRI-EAF production route, which carries a significantly lower carbon footprint. The new DRI - which will be the first of its kind in Spain - and EAF will be in production before the end of 2025.

disclosed, used, or reproduced without prior written specific authorization of ArcelorMittal – Privileged information.

ArcelorMittal

AM signed a LOI with Belgium authorities for a 1,1 Billion € investment that will allow AM Gent to reduced CO₂ footprint

28 September 2021 10:15 CET

ArcelorMittal signs letter of intent with the governments of Belgium and Flanders, supporting €1.1 billion investment in decarbonisation technologies at its flagship Gent plant

ArcelorMittal Belgium will reduce CO₂ emissions by 3.9 million tonnes per year by 2030, by building a 2.5 million-tonne direct reduced iron (DRI) plant and two electric furnaces at its Gent site, to operate alongside its state-of-the-art blast furnace that is ready to take waste wood and plastics as a substitute for fossil carbon.

Reducing company footprint with Green Steel Certificates

XCarb[®]

Green steel certificate



- Investment projects resulting in absolute CO₂ reductions
- Projects today focussed on gas injection technology
- Mass balance inspired by renewable energy certificates
- CO₂ savings passed onto customers as certificates
- **1t XCarb[®] green steel certificates = 2.112t CO₂ savings**
- Each certificate linked to an order of physical steel
- Independently verified by DNV

In a nutshell:

Magnelis® coated steels: a relevant choice for durable skins (roofs & facades) & all related structural elements



ArcelorMittal

Material

Processability

EPD Available



with less energy,
Abiotic resources
Run off

XCarb®

Green steel certificate

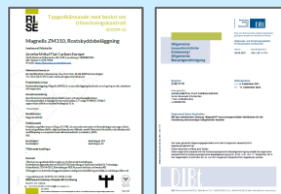
Aesthetic (skin)

Evolutionary, dark
Grey Patinated,
Low reflectivity

...

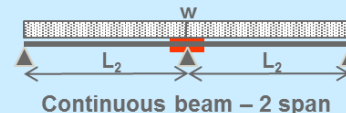
Durability (skin & struct)

Longer certified
Lifetimes than Z



Strength (understructure)

HyPer range
Up to S550GD for
light weight design



Continuous beam – 2 span

End Of Life

Reuse

Recycle



Lower CO₂ footprint over the life cycle