



ArcelorMittal

# Steel solutions for solar installations

Your partner around the world



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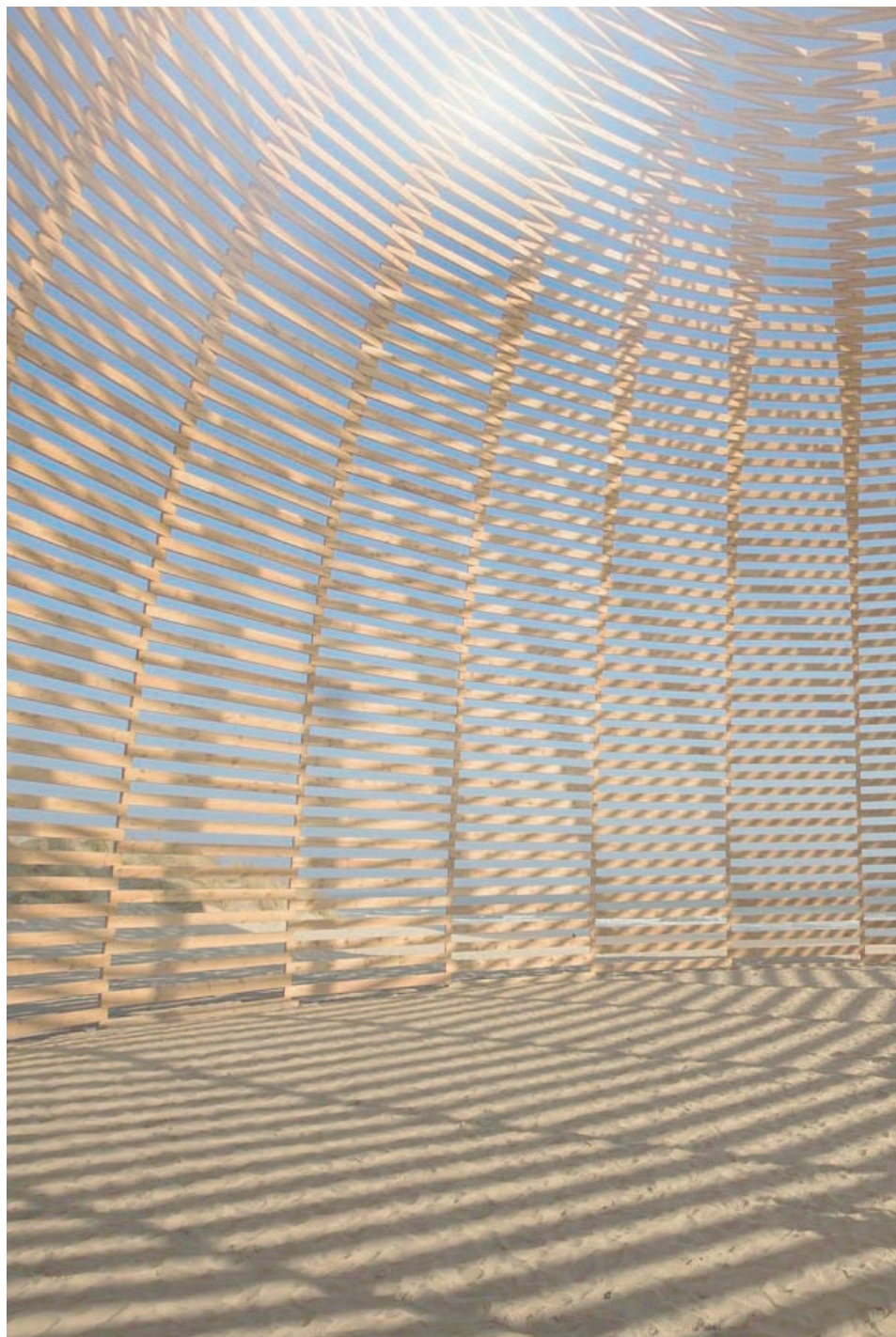
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# ArcelorMittal

## Your partner around the world



Increasing consumption of electricity and the need to reduce CO<sub>2</sub> emissions are two of the main reasons for the strong growth in renewable energy technologies. Ambitious greenhouse gas reduction targets in the EU and other regions are reinforcing this trend.

One of the most environmentally friendly ways to generate electricity is by conversion of sunlight using photovoltaic (PV) and solar thermal technologies. Using steel to build the support structures makes it even more sustainable as steel is a durable and 100% recyclable material.

ArcelorMittal supports the move to clean energy generation by offering high-performance steels, advanced metallic coatings, and structural solutions for PV and solar thermal installations. We also offer tailor-made services such as co-engineering and full project handling.

In a near future, our smart coated steel will allow your buildings to generate solar energy.



# Steel, the material of choice

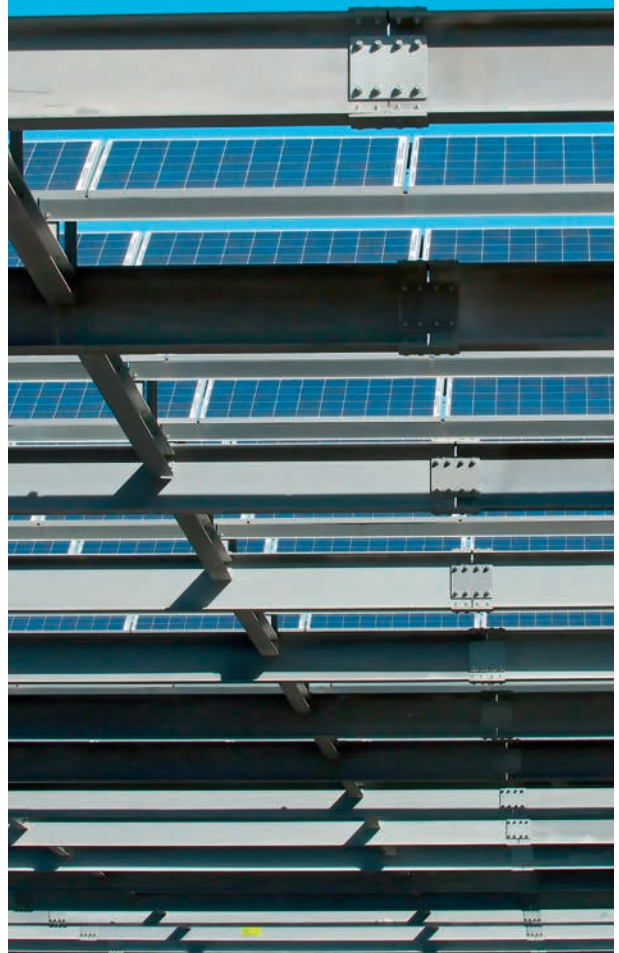
The main challenges for solar installation operators are:

- Ensuring cost-effective and very rapid installation
- Minimising maintenance costs throughout the lifecycle of the installation
- Guaranteeing durability
- Reducing the installation's environmental impact.

ArcelorMittal answers these requirements through our wide range of steel grades and innovative metallic coatings which result in cost-effective support structures for any kind of solar technology.

## Steel is

- Robust
- Sustainable and durable
- Formable
- 100% recyclable
- Economically competitive.



# Magnelis®

## An innovative metallic coating which offers protection in the harshest environments

ArcelorMittal offers a full range of metallic coatings to protect steel solar structures against corrosion. In addition to pure zinc and aluminium-zinc coatings, ArcelorMittal has developed a high-performance metallic coating known as Magnelis®.

Magnelis® is a unique alloy of zinc, aluminium and magnesium which provides excellent corrosion protection, even in soil. One of the most remarkable properties of Magnelis® is its ability to self-heal on cut edges, where corrosion typically begins. A protective film forms on the cut edge to protect it from the environment. This self-healing property ensures Magnelis® performs up to ten times better than galvanised solutions. Magnelis® comes with a 25-year warranty\* for solar support structures and is the first metallic coating to be guaranteed in marine conditions (C5M, ISO 12944-2), and in chloride and highly alkaline environments.

Magnelis® is applied directly to the substrate during steel production. The coated steel, with the required quality and properties, can be directly used for the fabrication of final structural parts and is compatible with all forming and assembling techniques. This leads to important savings in both costs and time.

Magnelis® can be supplied on a wide range of steel grades, allowing operators to optimise the design of their photovoltaic (PV) structure.

Magnelis® ZM310 in coating thickness of 25 µm per side, is particularly adapted for solar structures of solar farms. Thicknesses are available as from 0.45 to 6 mm.

The excellent corrosion resistance properties of Magnelis® have been assessed with a Preliminary Technical Evaluation of Material (ETPM) by CSTB (Centre Scientifique et Technique du Bâtiment) and certified by a number of other external bodies, among which SP (Science Partner) and DIBt (Deutsches Institut für Bautechnik).

Deutsches  
Institut  
für  
Bautechnik

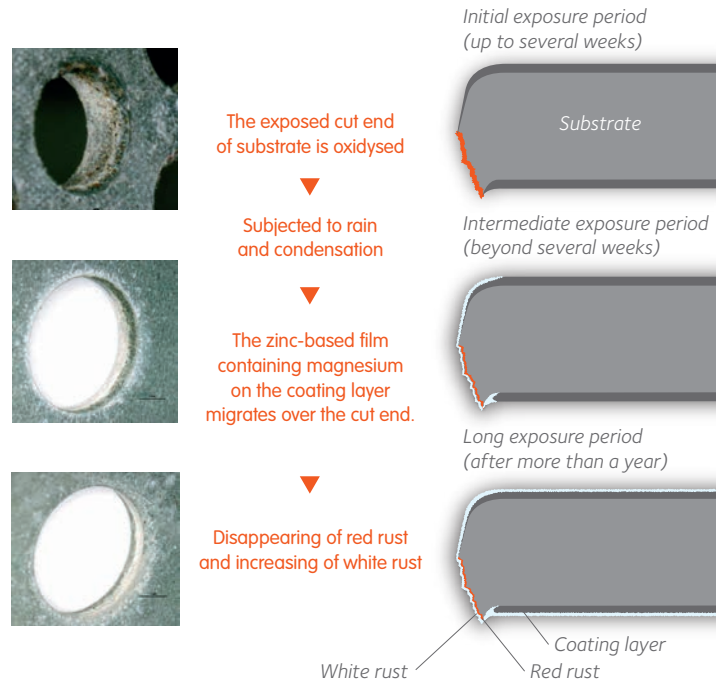


\* available upon request



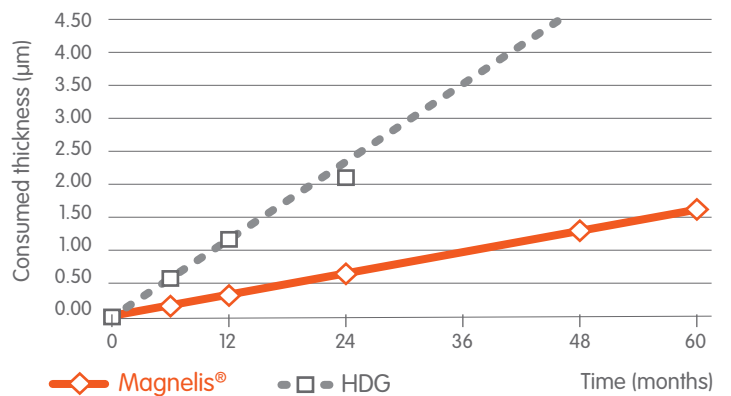
# Magnelis® advantages

- Outstanding corrosion resistance, at least 3 times better compared to standard galvanised steel, even in soil
- Self-healing effect protects cut edges
- Easy formability and weldability for cold-formed profiles, tubes, and hollow sections
- Most cost-effective alternative to aluminium, stainless and batch galvanization, thanks to the integrated production cycle and thinner coatings
- Available in a wide range of steel grades and thicknesses
- 25-year warranty in solar applications (Magnelis® ZM310)
- Little to no maintenance is required, reducing the operating costs of solar installations
- Environmental benefits including thinner coating and less zinc run-off to soil.



Zinc, magnesium and aluminium elements combined in the coating layer, create a thin film that protects cut edges against corrosive actions. Marine outdoor exposure test of Magnelis® in Brest (France).

Magnelis® loses three times less coating thickness per year compared to hot dip galvanised coatings.



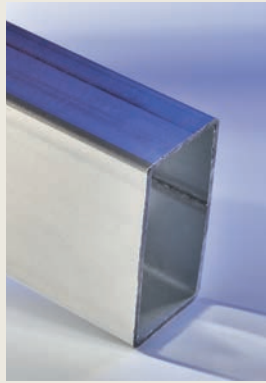
Magnelis® thickness evolution compared to standard hot dip galvanised steel (HDG). Results of a five-year outdoor exposure test of Magnelis® in Brest (France).



# A wide variety of steel solutions for solar systems

## Structures for ground-mounted systems

The structures supporting solar installations must sustain climatic loads such as snow or wind, while their coating needs to resist corrosion for decades. Different steel grades with high mechanical properties are available to ensure the excellent performance of the support structure.



ArcelorMittal can advise you on the selection of the steel grade which is most appropriate to the design of your structure. Options include cold-formed profiles, hollow sections or tubes, coupled with the proper metallic coating. All structural applications can benefit from the technical advantages of ArcelorMittal's Magnelis® coating described earlier.

ArcelorMittal's Tubular Products division offers excellence in tube manufacturing, guaranteeing the final performance of your solar structures. With production sites around the world, Tubular Products offers a wide range of welded tubes and hollow sections in various diameters and combined with the appropriate coating.

Profil du Futur, a company belonging to the Distribution Solutions division, offers its expertise in structural design and profiling for various markets. Using its industrial range of profiles (Multibeam, PSB, CE or U-shaped), Profil du Futur designs and manufactures structures for ground-mounted PV plants. Foundation solutions are adapted to all soil types and use rammed or anchored poles (depending on the location's characteristics).

Each project takes into account:

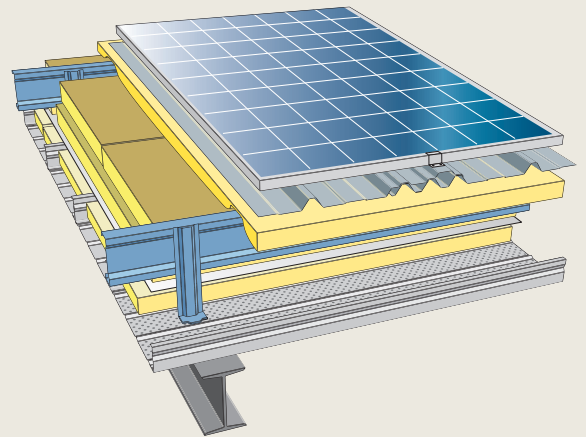
- The type of structure required (single- or dual-pole)
- Climatic and geological conditions
- Eurocodes' static and dynamic calculations.

Profil du Futur offers short lead times thanks to its integrated supply chain and a dedicated engineering office. The company works with approved installation partners.

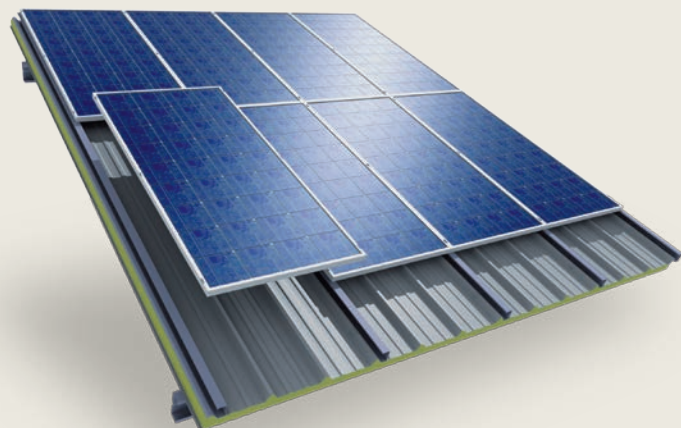
## Structures for rooftop systems

ArcelorMittal Construction is providing complete building solutions in Europe, and offers two PV rooftop solutions made of pre-painted steel:

Komet® is a simplified, integrated steel solar solution where PV modules are fixed directly onto a Hairexcel® pre-painted steel profile, without the need for fixing rails. Designed for non-residential buildings, Komet® perfectly meets the requirements of new buildings and roofing renovation projects. Easy to install, the solution is available in a variety of thicknesses and paint coating options to guarantee the tightness and durability of the roof system.



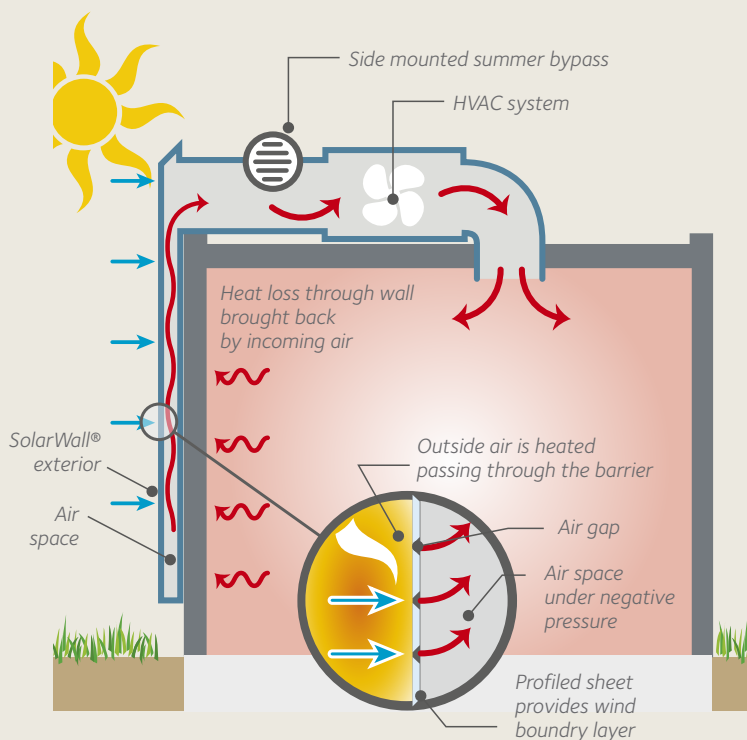
Kalypso® is a support system for PV modules which are fixed on pre-painted steel sandwich panels using the innovative and patented Ondafix® fixing rail. High performance sandwich panels with a 60 µm paint coating, Hairexcel®, are available in a wide variety of colours to match roof design. Quick and easy to install, Kalypso® is an economical solution.





## Solar wall systems

ArcelorMittal Construction has started manufacturing SolarWall® technology thanks to a unique agreement with the Conserval Engineering company who has commercialised solar-based air heating around the world.



The SolarWall® is a building integrated air-heating system which utilises solar radiation to deliver naturally warmed fresh air into buildings. A renewable heat source, SolarWall® is installed as an additional skin on a building to create an air cavity. SolarWall® consists of a pre-coated steel collector with thousands of carefully engineered perforations spread across its surface to collect the heated air.

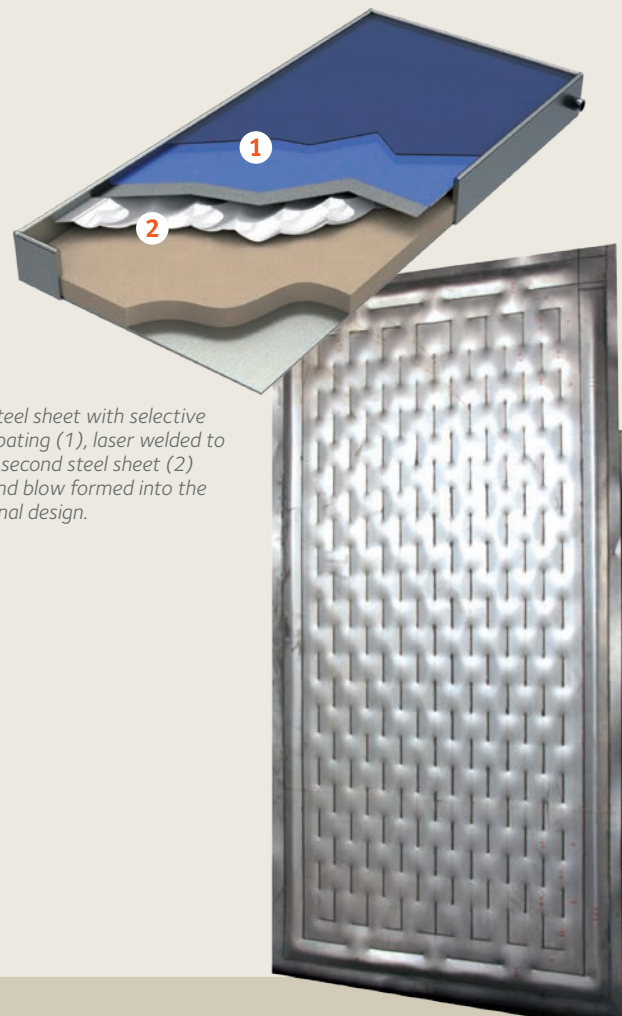
## Solar steel absorbers

Recently ArcelorMittal has developed a new generation of solar thermal absorbers which are fully made from steel. The design consists of a steel sheet with selective coating which is laser welded to a second steel sheet and blow formed into the final design.

The coating is applied by the ArcelorMittal subsidiary Arceo, an industrial production line dedicated to physical vapour deposition (PVD) technology. Arceo can produce selective coatings on various substrates. The assembly is carried out by ArcelorMittal Tailored Blanks, a division of ArcelorMittal which specialises in the production of laser welded blanks.

Optimised steel grades, with excellent corrosion resistance and durability at high temperature, provide the absorber with its high performance.

The good formability of steel allows the design of absorbers with a high contact surface between fluid and absorber sheet. This compensates for the lower conductivity of steel compared to traditional materials.



Steel sheet with selective coating (1), laser welded to a second steel sheet (2) and blow formed into the final design.

# High-tech engineered solutions

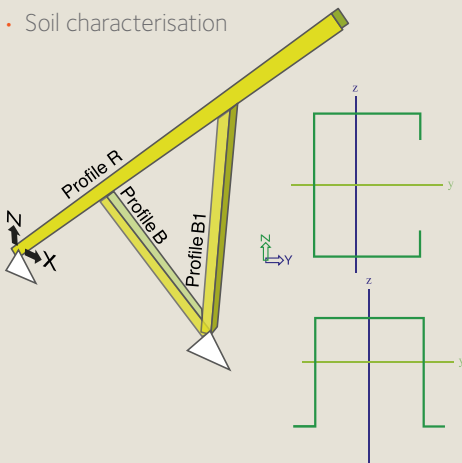
## Co-engineering support

ArcelorMittal's Global R&D teams are spread over 11 research centres worldwide and support ArcelorMittal customers at all stages in the development of new solutions.

Their expertise includes design, numerical modelling, physical tests on components and whole systems. The exact suite of solutions that can be provided depends on the needs of individual customers.

### Case study of a structural design optimisation

- Calculation based on Eurocodes
- Pull-out tests and optimisation of connections
- Soil characterisation



## From design to supply

Our Construction Projects division is a unique entity inside the ArcelorMittal Group. The group can deliver complete sets of trackers, ground mounted systems, or heliostats ready for installation at the project site. Construction Projects is also available to conclude pre-agreements and participate in consortia with third parties.

Construction Projects offers:

- Design optimisation (structure, material, process, coating).
- Project-specific supply chain services such as dedicated stocks near the project site and combined shipment with other balance of system (BOS) items.
- Frame agreement services with customised terms and conditions, warranties and pricing for individual or multiple projects.
- Financial and project-specific credit management solutions.
- Indexed pricing for long-term projects.
- Local content solutions such as mobile stamping and processing lines near the project site (no hall required).
- A specialised global network of experts, providing local support.



Mast robot welding for heliostats or trackers



Semi automatic welding lines for projects in the US and MENA



## How can Global R&D help you in your solar project?

- Select best coating and appropriate steel grades
- Assess resistance of mechanical assembly or adhesive bonding
- Prove reliability of assemblies (standards IEC 61215, IEC 61646)
- Calculate the static characteristics of steel structures
- Optimise structural designs.

## Tailor-made services

From products to tailor-made services, the ArcelorMittal Group is a global partner for any kind of solar project.

The ArcelorMittal Group relies on the expertise of its Flat Products and Distribution Solutions divisions, its Global R&D teams and our global network of agencies.

ArcelorMittal is strongly committed to developing safer and sustainable steels for solar applications.





## ArcelorMittal, your partner around the world

### Flat Products

[industry.arcelormittal.com](http://industry.arcelormittal.com)

### Distribution Solutions

#### Construction

[ds.arcelormittal.com/construction](http://ds.arcelormittal.com/construction)

#### Construction Projects

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#### Profil du Futur

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### Tailored Blanks

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### Tubular Products

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### Arceo

[arceo.be](http://arceo.be)



**ArcelorMittal**

### ArcelorMittal Europe – Flat Products

24-26, boulevard d'Avranches

L-1160 Luxembourg

[flateurope.technical.assistance@arcelormittal.com](mailto:flateurope.technical.assistance@arcelormittal.com)

[industry.arcelormittal.com](http://industry.arcelormittal.com)