

Stronger, lighter: innovating building structures to reduce environmental impact

Climate change is a key challenge facing today's construction industry. **ArcelorMittal, the leading global provider of steel for construction**, is working alongside constructors to develop innovative steel products with a reduced impact on the environment. Today, the group offers a variety of structural steels that are stronger and lighter, requiring less material and thus creating a smaller carbon footprint.

Histar® - high-strength steel for low-carbon construction

ArcelorMittal's Histar® steel grade, developed in cooperation with the Centre de Recherches Métallurgiques in Liège, Belgium, is a high-strength steel that combines very high yield strength, outstanding resistance to low temperatures and high weldability. Compared with basic steels, Histar® provides average weight reductions of 32% in steel columns and 19% in beams¹. These characteristics satisfy the need for light and economical structures that meet both safety and sustainability criteria. Using Histar® means a CO₂ reduction of around 30% in steel columns and around 20% in steel beams. ArcelorMittal produces around 50,000 tonnes of Histar® each year, representing savings of 14,000 tonnes of CO₂, equivalent to the annual emissions of around 4,000 cars. Histar® steel sections have been used in hundreds of iconic structures, such as the Freedom Tower in New York, the Emirates Tower in Dubai, the Federation Tower in Moscow and the World Financial Centre in Shanghai. Looking to the future, ArcelorMittal's R&D teams are developing even stronger, lighter steel with **Histar® Grade 70**. This development will also include improvements to toughness, resulting in steel structures that can withstand even the lowest temperatures.

The D2 Tower –30% less building material required with Histar®

The D2 Tower, the first steel-framed tower in Paris' business district of La Défense, and one of the first steel-framed skyscrapers in France, uses Histar®. Designed by architects Anthony Béchu and Tom Sheehan as part of an urban renewal project in La Défense, the D2 Tower is set to be one of the Défense's most striking office buildings. Standing 171m tall with 37 floors, the 50,000m² building is due to be completed in 2014.

ArcelorMittal is supplying 4,200 tonnes of steel to the project: 3,000 tonnes of Histar® jumbo beams from its facilities in Differdange, Luxembourg and 1,200 tonnes of cellular beams from its commercial sections entity Eurostructures, also in Luxembourg.

Aside from the great speed of construction it offers, using steel allowed the architects to use 30% less material compared to other structural solutions, thus improving the tower's environmental footprint.

Optimising building volumes with composite structures: “slim floors”

Developed by ArcelorMittal, the “Slim-Floor” system is an innovative, fast and economical solution which marries composite or prefabricated concrete slabs with built-in steel beams. This optimizes building volumes and reduces floor thickness, enabling room height to be increased, extra floors to be added or the total height of the building to be reduced. This allows for greater freedom in the design, as well as generating cost savings. The CoSFB (Composite

¹ <http://www.worldsteel.org/steel-by-topic/sustainable-steel/company-case-studies/high-strength-construction-ArcelorMittal.html>

Slim-Floor Beam) has been specifically designed by ArcelorMittal for this system. Designed for beam spans of 8-14m, CoSFB adapts perfectly to the long spans required by modern architecture.

In January 2015, ArcelorMittal Europe – Long Products was awarded a prize by the German steel construction industry for its development of an innovative concrete dowel technology as part of the design of the CoSFB.

Castellated and cellular beams: flexible, functional and sustainable

Over the last decade, there has been an increase in the use of cellular and castellated beams in metal structures. **ArcelorMittal's ACB® cellular beams** provide an attractive, practical solution in terms of use of space. Their circular openings drastically reduce the amount of material required, creating a transparent effect, lightening structures and increasing structural spans by up to 40 metres. **ANGELINA®** is a new generation of castellated beam developed by ArcelorMittal, designed to simplify the construction process while maintain structural elegance. Its light, high-strength design reduces the steel weight in the slabs of office buildings to less than 30 kg/ m². Like ACB® cellular beams, ArcelorMittal's ANGELINA® beams can lighten building structures and increase spans, freeing up space by increasing the size of column-free floor areas and reducing fabrication costs.

ACB® and ANGELINA® beams are intrinsically ecological, helping to optimize building volumes, reduce the quantity of construction materials, thus limiting the use of transport, and shorten construction time. Both are highly functional, allowing ducts for heating, ventilation and air conditioning to pass through the openings without changing the building structure.