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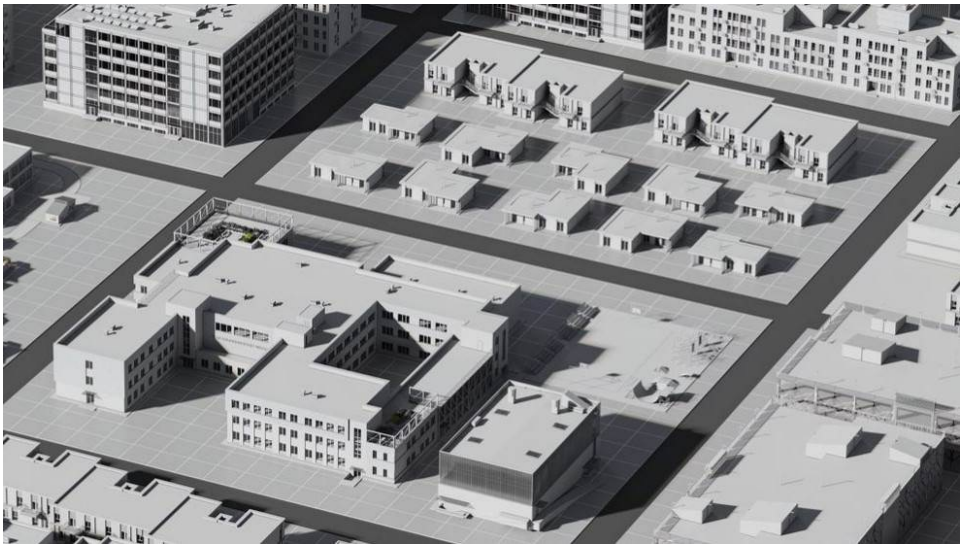
Pillar of the future. How to use steel in rebuilding Ukraine

The use of steel in housing construction is terra incognita for Ukraine. How the steel industry will become the basis for the country's future recovery after the war.



Russia has damaged or destroyed at least 163,000 residential buildings, the government estimates. The full-scale war has caused widespread destruction of social and industrial infrastructure.

The government, society and business have started discussions to outline a vision and strategy for the country's future recovery.

Big business plays a key role in the reconstruction process. The experience of business owners, their expertise and access to resources will help to speed up the processes, make them simpler and more efficient.

One of the technologies that can accelerate recovery and is widely used around the world is the construction of steel-frame buildings. Will steel construction become the basis for rebuilding Ukrainian cities?

How Steel is Used in Construction

Steel has a unique combination of properties that make it an ideal material for a wide range of applications. It is used to manufacture cars and industrial equipment, as well as in the energy and infrastructure sectors.

More than 1.5 billion tonnes of steel are produced annually. One of the largest consumers of iron-carbon alloy is the construction sector, which accounts for more than 50% of global demand.

The metal is used to make frames, roofs, cladding and reinforcement for reinforced concrete structures.

In Ukraine, the largest consumers of steel are metal structures plants that are actively engaged in construction for the commercial sector. They purchase large volumes of rolled steel for the construction of such facilities as shopping centres, office buildings, agricultural and industrial buildings, bridges and other linear structures for the energy sector.

The use of steel frame construction technology for residential buildings is a common practice around the world. This includes not only skyscrapers but also low-rise apartment buildings.

For example, in Australia, due to the shortage of timber, steel frames were used as early as the 1960s. In this country, the popularity of this method of construction has become unprecedented.

According to Grand View Research, the global steel framing market was valued at $36.01 billion in 2022 and is expected to grow at an average by 5.1% from 2023 to 2030.

In Ukraine, steel is used mainly in the construction of non-residential buildings. According to the public affairs office of Rinat Akhmetov's Metinvest Group, the industry was the largest buyer of finished products in 2021.

"40% of steel products produced were used by the industry for the construction of plants and factories, 34% - by the commercial and public sectors (shopping centres, shops). Another 17% was used for engineering structures (power lines, thermal power plants, motorways), and 5% for logistics (warehouses and storage facilities)," Metinvest Group explained.

The distribution is now changing: the share of manufacturing and industry has decreased, but there is growth in the category of engineering structures.

Steel Frame Housing

The pioneer in the use of metal structures for housing construction was Mariupol, where Metinvest SMC, one of the largest suppliers of retail steel products to the Ukrainian market, worked on projects.

In 2020, the company launched a joint project with the state and local authorities to build a 120-apartment building on Amurskaya Street using steel-frame technology .

The total construction cost was about UAH 120 million. The frame of the 8-storey building was filled with reinforced concrete walls and bricks. The design life of the building exceeds 100 years.

"The industrial nature of the manufactured steel frame elements reduces the construction time, which allows us to start work faster. In addition, this method significantly reduces the cost of organising the construction of the building," the Ukrainian Steel Construction Centre Association says.

The Association adds that the use of a steel frame reduces the seasonal risks of construction in winter, as there is no need for additional costs for work at sub-zero temperatures.

The use of steel structures reduces the overall weight of load-bearing structures compared to a reinforced concrete frame. A steel structure is about 30-60% lighter than the same concrete structure.

The pilot project inspired Metinvest to create the Steel Dream concept for rebuilding the country. It contains a set of ready-made solutions for the construction of housing and social infrastructure that can be adapted to the needs of individual communities.

Metinvest-SMC specialists have developed designs for 13 types of steel buildings, each of which is available in several versions to suit different conditions and circumstances.

These include residential buildings (houses with 1-8 floors, a dormitory, and a hotel), social infrastructure (school, kindergarten, outpatient clinic), and infrastructure facilities (car park, sports complex, and underground shelter).

In total, the concept provides for more than 200 ready-made building projects based on three prefabricated steel elements: a frame, a module and a platform. Using this method, a one-storey building can be erected in 2 months, an eight-storey building in 9 months, and a kindergarten in half the time it usually takes.

New Solutions

Steel beams and columns are used to create the building frame, providing support for the floors, roof and walls. Steel is a strong and durable material that can withstand harsh weather conditions and natural disasters such as earthquakes and hurricanes.

Steel-framed buildings are erected quickly, which reduces construction time and costs. Manufacturers cite speed as the main advantage of this method.

"The most important advantage of steel construction is speed, which is so necessary in reconstruction. Thanks to prefabrication solutions (when elements are prefabricated at the plant - ed.), we can achieve 30-40% time savings compared to other technologies," the company explains.

The frame allows for flexible planning solutions and an increase in the number of usable square metres.

In addition, the use of steel meets the challenges of our time - this material is recyclable. The metal is 97% recyclable.

The disadvantages of using steel frames in construction include:

- meticulous approach to design. Steel structures production requires more detailed and professional design, which makes it difficult to change the project after construction begins;

- corrosion. Steel is prone to corrosion, especially in humid or coastal environments. This problem is solved by applying a protective coating and regular maintenance;

- thermal conductivity. Steel is a good conductor of heat, which can lead to higher heating costs in winter and cooling costs in summer. Modern thermal insulation solutions are used to improve the energy efficiency of steel-framed buildings.

Steel consumption in the domestic construction market is expected to increase in the coming months. This will primarily be in the areas of infrastructure reconstruction and the residential segment.

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