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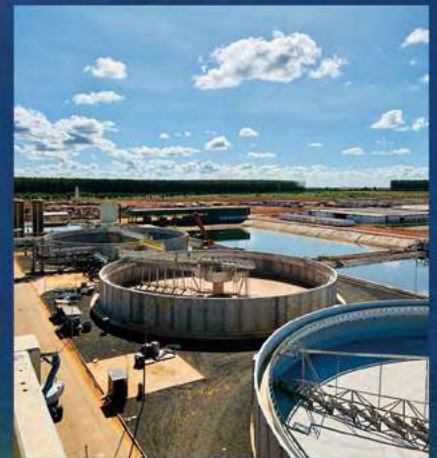
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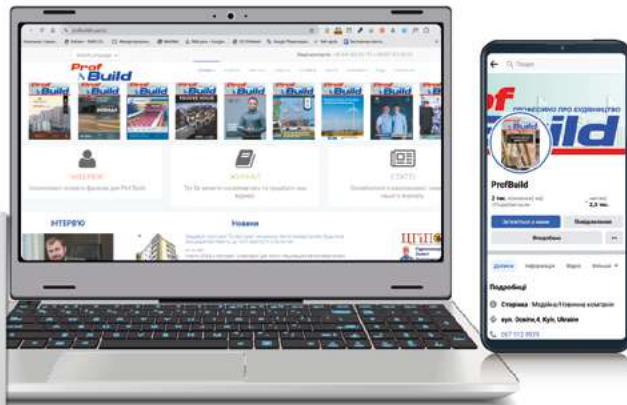
UKRAINIAN EDITION ABOUT CONSTRUCTION

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- ARTICLES ABOUT MATERIALS AND TECHNOLOGIES
- INTERESTING INTERVIEWS
- ANALYTICS
- NEWS

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UKRAINIAN BUSINESS INFORMATIONAL AND ANALYTICAL MAGAZINE ABOUT MODERN CONSTRUCTION

The purpose of the magazine

To cover the latest information about construction and real estate in Ukraine and other countries of the world, to acquaint the readership with new technologies, materials and services in construction; to draw attention to the problems of the construction industry, to find ways to solve them together with leading experts; to highlight the activities of companies operating in the construction market and the most interesting events in the construction world.

Publications in Prof Build are an opportunity to use the possibility of communicating with your target audience in an accessible format

Prof Build magazine is a member of:

Confederation of Builders of Ukraine (CBU), All-Ukrainian Union of Building Materials Manufacturers, Construction Chamber of Ukraine, National Expert Construction Alliance, National Union of Architects of Ukraine, and is a media partner of the Football Association of Builders of Ukraine (FABU).

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Dear friends, colleagues, partners!

Despite the shelling and destruction, the construction industry continues to work. The editorial office of the Prof Build magazine is also working, and once again you have the opportunity to turn the pages of our latest issue.

We owe this opportunity first and foremost to the courageous and unbeatable Ukrainian defenders who fight back for our independence and freedom.

By the way, as of January 2024, the amount of direct damage caused to infrastructure during the war reached almost UAH 155 billion. However, among all the challenges of the time, the issue of staff shortage is the most acute at the moment. At the same time, noticeable changes in the labor market are the increase in the number of women in traditionally male-dominated professions. Attention should also be paid to the preservation and development of vocational and technical schools which are currently the base for training of qualified personnel. This information was shared with us by the head of the Construction Trade Union of Ukraine, Vasyl Andreyev. You can read the detailed interview in this issue in the Interview section.

Essentially, currently the main task for Ukraine is to defeat the enemy and return to a peaceful life. But it is equally important that the country's economy is able to withstand this war and provide resources for the frontline. And considering that building materials are also a component that the front needs now, for example, for the construction of defense structures, the question of the readiness of the domestic market for urgent and expected needs is quite timely. Therefore, you can learn about the state of the building materials market in the articles from the Materials and technologies section.

We try to keep up with the times and cover relevant information, so we tried to make this issue as interesting and useful as possible. I hope we succeeded.

Only forward — every day, every minute!

*With faith in Victory,
founder and editor-in-chief of Prof Build magazine
Svitlana Shakh*

General Partner



Magazine

«Prof Build»

Founder: Svitlana Shakh
Publication frequency: 4 times a year.
Circulation: 3000 copies.
Registered by the State Registration Service of Ukraine.
Certificate of registration KV №19931-9731R
Annex to ProfBuild magazine

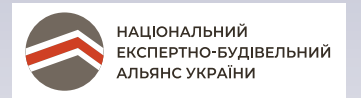
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Printed by:
contractor IE Kudina G.O,
at the typography
«ART STUDIO OF
PRINTING» LTD.
Tel: +38 (067) 460-07-25
www.artprintstudio.com.ua

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OLEKSIY DNIPROV: «Vision and prospects of education and science in Ukraine»



Oleksiy Dniprov recently took the position of Chairman of the Supervisory Board of the Kyiv National University of Construction and Architecture (KNUBA), and in an exclusive interview he reveals his vision for the future of education and science in the field of construction. His insightful analysis and prognostic views on the development of this important industry will be valuable to anyone interested in current trends and prospects in construction.

✓ **You were recently appointed to the position of Chairman of the Supervisory Board of the KNUBA. Tell me, have you collaborated with the university before?**

My connections with KNUBA go back a long way. I have been a member of the Supervisory Board of this prestigious institution. My cooperation with the management and staff of the university lasted for many years, in different positions and under different life circumstances. Petro Kulikov, the rector of the university, and his vice-rectors have been colleagues for many years. We collaborated on various issues, but the most important of them was the development of the university in various directions. We have always kept in touch and tried to solve problematic issues that arose in the work of the university.

✓ **Tell us about the activities of the Supervisory Board of the Kyiv National University of Construction and Architecture.**

The supervisory board of a higher educational institution is a consultative and advisory body consisting of highly

respected specialists in various fields, including education, construction, architecture, physical culture, and sports. Council members are not university employees, but they help to design and implement the university's development strategy. This body is responsible for creating, discussing, and assisting in the implementation of the strategy. I would call it a strategic management body, since its main function is not operational management, but the design of strategic directions for further development of the university. This is the key role of the Supervisory Board.

✓ **What achievements in the development of KNUBA are you proud of?**

I am proud of infrastructural development of the university. During this time, the property and assets were significantly increased, the sports complex was reconstructed. All illegal objects were removed from the territory of the university. I am proud that now the university looks like a real university. This is thanks to our collective work, but primarily thanks to the rector Petro Kulikov. Over the years, he has preserved and increased the material base of the university and continues to develop it now.

✓ **Why is it strategically important to preserve and develop education?**

Education is the basis for acquiring knowledge, which, in turn, is the basis for development. Without knowledge, society cannot develop and compete on the world stage. Knowledge opens a window to the civilized world. We aspire to become members of the European Union and NATO, but without a highly educated society we will not be able to become full members of these organizations. Knowledge is security. The fact that we have been indomitably resisting the vast army of our enemy for two years now is the result of our defenders being more educated and trained. They can easily use foreign equipment, create new technologies, use drones, etc.

✓ **What main challenges is education in Ukraine facing now?**

The situation we are now facing calls for immediate action to adapt our educational institutions to wartime conditions. First of all, this is about ensuring safety — meaning creating shelters, adapting the educational process to the conditions of war. This requires significant costs, the funds for which, unfortunately, are often lacking in the budgets of educational institutions.

Financing is the second important aspect. The state budget cannot fully cover all the needs of our institutions, so it is necessary to focus on finding extra-budgetary funds for infrastructure and security projects. There are many different programs, but they are often very scattered. In my opinion, the task of the state, in particular the Ministry of Education and Science of Ukraine, should be to concentrate these programs into a single one, which would aim at supporting the infrastructure of educational institutions in wartime conditions. This will help avoid dispersal of funds and ensure more effective use of international financial assistance. Perhaps it is worth considering the creation of a coalition of donors and development of a single financing mechanism. If we do this and can ensure safety for our staff, pupils, and students, it would be a powerful incentive for them to return.

✓ **Tell us about the advantages and disadvantages of dual and mixed forms of education.**

My opinion, based on my own experience and communication with teaching colleagues from various higher education institutions, is that online education, although convenient, does not always ensure high quality of education. I believe that high quality education can be achieved only in the classroom, when the teacher directly transmits his knowledge to students who perceive, assimilate, study, and analyze it. Unfortunately, this cannot be achieved through online learning. The online format saved education during the COVID19 pandemic. It allowed students to continue their studies, despite the lockdown restrictions. However, the quality of education still depends on classroom learning, live communication with the teacher and socialization with classmates. I believe that we should create conditions for safe offline learning so that the maximum number of institutions can return to this format.

The dual form of education, which involves training of students and simultaneous on-the-job training, is a very effective form of education.

✓ **To what extent is the construction market in Ukraine ready and interested in cooperation with educational institutions? Are the companies ready to provide their facilities for dual education?**

Large, internationally recognized companies actively attract students, offering them jobs. They understand the importance of training professionals from an early age, which gives them advantages. However, there are companies that do not yet realize their role and mission and are only focused on making profit. Companies that focus their work on development and the future have great prospects. I hope that there will be more such companies.

✓ **As the Chairman of the Supervisory Board of KNUBA, what plans and tasks do you consider to be of highest importance?**

The need for radical changes in higher education, including changes in legislation and the structure of higher education, is being actively discussed in modern society. However, this discussion does not always help to achieve objective and fair results. Often, public slogans get in the way of professional discussion, which can lead to the loss of unique activities that are important to each industry.

In this period of turbulence, the main task of the Supervisory Board is to preserve KNUBA as a unique university for research in construction and architecture. We must preserve its exclusivity, prevent its liquidation or merger with other educational institutions. On the contrary, we should make it a center of education in the field of construction and architecture.

Today, many educational institutions are engaged in training of personnel in this field, and this creates a problem. Dozens of educational institutions have licenses for training construction specialists, in particular, for professional pre-higher and higher education. Unfortunately, in many cases this process is chaotic and unprofessional, without coordination. As a result, there are many specialists in the labor market who only have a diploma but do not have the necessary skills.

I would like KNUBA to become a single center for training specialists in the field of construction and architecture in future. It should become a coordination center, a scientific and methodical center in this field at the national level. It should unite all institutions not legally, but scientifically and methodically, by creating a consortium of the institutions. This will

allow them to show their capabilities, to open laboratories, libraries to each other and coordinate efforts to improve the quality of providing knowledge for future specialists. We must ensure that there are highly qualified specialists on the labor market after completing their studies. Small educational institutions will not be able to survive in such a competitive environment by themselves, but they are necessary for our economy. I am convinced that the field of construction will become the principal one after our victory, all construction specialists will be in great demand, and their work will have a high value.

✓ **What is the role of science in the future of the country? What areas do you think will be in demand?**

Science is an important component of state security, as well as education. Without a powerful scientific base, we cannot be considered a strong state. If we do not invest in development of science, we will not be able to be competitive in the world.

Our priority is defense science. We need to create weapons, air defense systems, means of destruction, and also build fortifications. This requires us to develop science in the field of defense and security. Cyber security, biotechnology, nanotechnology, and space research are also important areas. I believe that we should focus on these three areas: science in the field of security and defense, cyber security, and biotechnology.

✓ **In your opinion, how can the cooperation between science and industry in Ukraine be improved?**

Implementation of scientific developments in industrial practice is an important task, but it is also a big problem. Science and practice often exist in parallel, but do not always intersect. Companies that are aware of their purpose and their development path are usually interested in creating platforms for scientists, holding startup competitions and other activities that promote development.

One of the best examples of this combination is the creation of technology parks where universities and industrial companies can collaborate. Such experience already exists, for example, the Sikorsky Kyiv Polytechnic Institute technological park.



The Government should state a clear task for scientists from the point of view of the needs of the economy. It can be a government order for scientific developments that the economy needs. Thus, I see three main directions: conscious business, technological parks, and clear government order.

✓ **How to get people interested in science in Ukraine?**

The biggest incentive is the financial and material aspect. A young scientist, whom we want to keep in science, must be sure of his financial stability and financial security. Our PhD programs in certain fields are recognized and valued, but we must understand that everyone knows very well where the quality graduates are. When you are trying to get a job abroad with our PhD, employers look primarily at your research papers, not your diploma.

We have to create incentives for young scientists at the state level so that they can work at ease. There are examples when scientists themselves, not the Government, were able to create conditions for obtaining sufficient income and attracting young specialists. For example, the research department of Sumy State University succeeded in commercializing its findings and creating an effective research center. There are also such examples at the Lviv Polytechnic, where a powerful business incubator has been created on the basis of the university. Based on these examples, we can develop a state program.

✓ **How do you see the future of construction in Ukraine? What technologies or innovations do you think will be key in this industry?**

Information technologies that are actively implemented in construction. The use of drones during construction work, computerized construction management systems, and smart home technologies already at the construction stage are just a few examples. One of the key trends is the use of computer technologies. Another important trend is the use of 4D printing to create light construction objects and complete houses. This technology makes it possible to significantly save on construction, in particular, on the use of labor. In Ukraine, there are already the first attempts to use these technologies. For example, 3D printing is already being used in one of the schools in the Kyiv region. It is a very interesting experience that is worth learning. In construction, there is also a search for new, ultra-light materials that allow creating lighter and faster buildings. It also contributes to the development of the green trend in construction.

✓ **What are your thoughts on the role of Ukraine in the world community? How do you see the future of Ukraine in the international arena?**

I believe that Ukraine will become one of the most developed countries in the world. But for this we need to make a lot of effort. Everything depends on us: on our work, on our education. We must prepare ground in various areas of life for our breakthrough after victory. We have to show our interest in the development of our country. I am sure that when we show our results, the world will believe in us and investors will come.



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OLEKSIY SHKURATOV: innovations, education and reconstruction



Changes occurred in the leadership of the Institute of Innovative Education of Kyiv National University of Construction and Architecture (KNUBA). It is now managed by Doctor of Economic Sciences Oleksiy Shkuratov. This is a new milestone in the history of the Institute, with a new approach and visionary plans. Oleksiy Shkuratov, the newly appointed director, spoke in an interview about the challenges and opportunities of the educational sphere in Ukraine, as well as the impact of the war on education, the importance of innovative technologies in education, and plans for improving the qualifications of veterans. This deep conversation provides insight into the future of education in Ukraine.

✓ **First of all, we would like to congratulate you on your new appointment and ask about the experience you have gained in previous positions, in particular as vice-rector for scientific work at the National Aviation University and as deputy minister of education and science for European integration.**

— For the past 15 years, I have worked in the scientific field, including in the position of Deputy Minister, where I coordinated the scientific work. My work at the Ministry of Education and Science allowed me to form a vision for the development of education, taking into account the experience of working at different levels of the education system. Now, with this experience, I see opportunities for the development of the Institute. My professional connections and already implemented projects help me in this.

What kind of team would you like to see next to you? What is important for you in choosing employees?

— It is important for a person to be a professional in his field, to have the necessary knowledge and abilities to perform their duties. Willingness to learn and to develop is appreciated. The readiness to work in the system is important. Personally, I highly value honesty and openness.

✓ **Please, share your personal goals as well as those for the Institute.**

— Taking into account Ukraine's post-war need for construction workers, our Institute strives to introduce innovative technologies into training. Personally, I aim to strengthen the scientific activity of the Institute. For example, directions related to the Institute's activities: scientific and technical support of construction objects, land management, geodesy. We plan to raise funds for scientific work, fulfill orders from the private sector and participate in government programs. In the nearest 2-3 years, we aim to attract international funding, in particular through the Horizon Europe program.

Another direction is upskilling for the veterans. After the war, many people will need new knowledge and possibly rehabilitation. We are considering the possibility of creating educational programs for veterans, in particular in the field of IT technologies and cyber security. This will help people with disabilities who cannot work in traditional construction specialties to master more digital directions.

✓ **How did the new circumstances affect the organization of the educational process and the structure of the Institute of Innovative Education of KNUBA?**

— Before the full-scale invasion, the KNUBA Institute of Innovative Education focused on part-time distance education, providing the opportunity to obtain a second degree. However, the war made adjustments to the educational process.

It is clear that post-war reconstruction will require specialists in the field of construction. Today, the Institute not only continues its work as an institution of postgraduate education, but also actively trains full-time specialists for the bachelor and master level. In 2023, there is already high demand for our specialties, especially for full-time education.

The war and constant air raid warnings, unfortunately, do not allow to fully provide education in the offline mode. Many universities switched to distance education already during the pandemic. This also applies to KNUBA, which introduced a mixed education format. Taking into account the security situation, most subjects are taught online.

As for our students, they are students who have already acquired basic knowledge on a full-time basis, and now continue with the second degree. They conduct research work at their workplaces, realizing a practice component of education. It is similar to a dual form of education. I believe that after the war there will be a great demand for engineering specialties.

Regarding changes in the structure of the Institute, at the beginning of the war we decided to combine two de-

partments in order to optimize the educational process. Now students from four different specialties study at one united department. For learning efficiency, we also created small groups.

✓ **In your opinion, what factors motivate students who already have one higher education to obtain a second one? What innovative programs are planned for implementation in new courses, in particular, having in mind the aim of contributing to the reconstruction of the country?**

— The KNUBA Institute of Innovative Education was created with the upskilling purpose. We offer two directions: certification of already graduated specialists in architectural design and development of urban planning documentation, as well as basic education at the bachelor's or master's level.

Our new innovative educational programs will be aimed at rebuilding of the war-torn areas. In particular, we develop programs that allow one specialist to deal with spatial planning of territories, which involves urban planning and land management documentation. That is, during 1.5 years of study in two specialties, students can get education in 2 directions. This is especially convenient for those who already have an education, such as a land surveyor, but want to gain additional knowledge of architecture for effective spatial planning.

✓ **When developing new educational programs, in particular those aimed at reconstruction, which countries and higher educational institutions do you turn to the experience of?**

— Currently, we are developing new educational programs, but we are not yet teaching them. We offer advanced training courses for already trained specialists who want to participate in reconstruction. We also analyze the world experience of reconstruction after the World War II and the experience of the countries of the Middle East, such as Iraq.

In addition, NGOs are currently coming to Ukraine with grant funds, and are conducting educational programs for the reconstruction of our state. Our staff analyzes this experience, covering areas from IT to energy. We expect that complex programs will appear soon, and we will certainly join them, taking into account the experience of foreign specialists.

✓ **What challenges do you, as a director, face in your work? Are there any among them that are not directly related to the war?**

— Besides war, there are other challenges we face. First, the war caused an outflow of personnel — some of our specialists fled, some teach online. There is a risk that some of them will not return after the war. Secondly, we observe a decrease in the number of students, despite the demand for our specialties. After all, many young people left to study abroad.

There are also challenges associated with the reform of higher education initiated by the Ministry of Education and Science. In particular, there is a threat of abolition of vocational pre-university education and vocational colleges. But it is important for us because a significant number of our students apply being on this level of education, already having a certain level of education and practical ex-

perience. In my opinion, such threats do not contribute to the development of the educational process.

✓ **What consequences may arise as a result of the implementation of this reform?**

— The consequence of the adoption of this reform may be a difficult choice for students who, after graduating from school, entered college, expecting to receive a profession in 2 years. They could work, accumulate financial resources and get an education on their own. Now they are faced with a choice: either go to a technical vocation school, which is a lower level of education, or become an unskilled worker. After vocational school, they will still need to study for 4 years. They could immediately enter the 2nd or 3rd year, depending on the specialty, and finish the bachelor's degree in 2 years. Thus, students have to decide whether they should study at all.

✓ **Are innovative directions planned in the latest educational programs that specialists can use for reconstruction? For example, will they include energy efficiency?**

— Educational programs will contain skills and knowledge focused on modern technologies. However, their use and implementation will depend on investment in post-war reconstruction. It is difficult to predict.

✓ **Do you think that with the improvement of the security situation in Ukraine, foreign students will return to us? Do you expect that they will be attracted not only by the availability, but also by the quality of education that meets the standards of developed countries?**

— Foreign students who studied in Ukraine chose our country because of the relatively low cost of education and a high level of basic knowledge. For technological subjects, we can provide theoretical knowledge, but practical application may be more difficult due to economic constraints. For example, we have a 3D printer for printing houses, but its use in production is not yet widespread. Architecture students can gain knowledge on a level with other countries, such as the USA and China, especially in the field of software. I see the prospect of returning students from Asian countries, especially from China, where there is a great demand for specialists in the field of construction. Due to the high economic potential, they are looking for countries where they can get a quality education, such as Ukraine.



VASYL ANDREYEV:

«How to preserve the construction industry of Ukraine?»



Russia's large-scale war against Ukraine brought a lot of grief and challenges to Ukrainian families, as well as significant destruction of residential and industrial infrastructure, of many cities, towns, and villages. The reconstruction that continues today, despite the war, has presented many challenges that need to be overcome right now. Among the most pressing issues are the preservation of building personnel and training of new employees, low wages for construction workers, safe work on construction sites, exposure to hazardous substances, threats to life, etc. Vasyl Andreyev, head of the Construction Union of Ukraine, spoke about the challenges during the reconstruction of Ukraine and possible solutions.

The difference of 464,500 people between employed workers in the industry and full-time workers demonstrates the use of various forms of employment of construction workers, which, accordingly, affects informal employment among construction workers, which continues to grow today, according to various unofficial estimates.

At the same time, we should take into account that currently the official share of builders is decreasing because of the influence of mobilization and migration. Therefore, the issue of labor shortage arises.

According to the Ministry of Economy, over the next 10 years, Ukraine will have to attract an additional 4.5 million employees to the labor market. Although, according to the calculations of the International Labor Organization, 8.6 million additional workers will be needed to restore Ukraine, which is twice as much as the government estimates.

Already today, knowing these indicators, we hear that after the end of the war, we should expect a mass return of refugees. Perhaps some will return to work for 300 euros, but the greater part will still work abroad, receiving European-level salaries. As for labor migrants, it is difficult to predict anything here at all — if they do come to us, they will be construction workers from the poorest countries who are willing to work in difficult conditions.

✓ **By the way, what is the situation regarding the salary of construction workers**

— The average monthly salary of workers in the construction industry over the past 3 years was UAH 11,289 (2021); UAH 9,781 (2022); UAH 12,634 (2023 and at the beginning of 2024). Although in many job offers advertisements we see construction workers' wages from 20,000 to 30,000 hryvnias. The builders themselves confirm that such a salary exists, but in reality, they are paid a little more than UAH 12,000, and the other part of the salary is offered "in hand", that is, non-officially, and it is not a fact that the employee will receive it (a kind of lottery).

✓ **Let's start with the issue of construction workers. How many of them are on the labor market?**

— Before the start of the war, according to the indicators of the State Statistics Service of Ukraine, 690.8 thousand people worked in the construction industry (employed population by types of economic activity by region in 2021), and the average number of full-time employees was 226.3 thousand people (2022).

✓ **Unfortunately, today the issue of safe construction work has a different tone. If before it mainly concerned safety rules on the construction site, now there are many additional factors.**

— Exactly, shelling, mined electric poles, undamaged explosive objects (including the remains of rockets) are all that surround us today, and are also a real threat to the lives of construction workers.

Today, most construction workers are working on the restoration of damaged buildings and objects — it is clear that these places are extremely dangerous, because working under shelling is very risky. In addition, there is the threat of asbestos contamination, which we all have to hear about every day and know that asbestos is a highly dangerous material that can cause cancer if inhaled.

This is a big problem now, because with a lot of destruction, we also have a problem with asbestos disposal.

Construction workers, as well as firefighters and emergency workers, must be protected as if they were working with the Ebola virus, because asbestos dust is spread everywhere today.

At the same time, there is another problem common on construction sites, where the reconstruction or construction of housing, social infrastructure facilities, kindergartens, schools, hospitals in war-torn cities and villages is ongoing, and this is the neglect by the builders themselves of using protective equipment on scaffolding and roofs houses, etc.

You are asking why is this happening? Because there is no labor protection control.

✓ **In your opinion, how much money is needed for restoration and reconstruction?**

— The amount of direct damage caused to the infrastructure of Ukraine during the war reached almost USD 155 billion as of January 2024. This assessment also takes into account the damage caused to Ukraine due to the destruction of the Kakhovka Dam by the aggressor country on June 6, 2023 (the assessment of direct physical damage was carried out by the analytical team of the Kyiv School of Economics (KSE)).

The housing fund remains in the first place in terms of the amount of losses. Donetsk, Luhansk, Kyiv, Kharkiv, Chernihiv and Kherson regions are among the regions with the largest number of destroyed residential buildings. Next

comes the infrastructure (losses of industry and enterprises), the energy industry, and the agro-industrial complex.

✓ **Despite the shelling and destruction, construction industry continues to work and to build. How do you assess its condition today and what is the driver of growth?**

— The index of completed construction works in Ukraine according to the results of January-June (I half) of 2023 increased by 18.4 per cent compared to the same period of 2022. The volume of completed construction works during this period in monetary terms reached UAH 53.2 billion.

The driver of construction growth in January-June was engineering structures — the indicator in this sector increased by 34 per cent. At the same time, the volume of residential construction decreased by 5.9 per cent, and the volume of non-residential construction increased by 9.5 per cent. In monetary terms, the indicators of residential construction reached UAH 8.92 billion, non-residential construction — UAH 13.7 billion, and construction of engineering structures — UAH 30.6 billion.

The growth of engineering construction is connected with the restoration of transport and industrial facilities destroyed by Russian military aggression, as well as bridges, roads, railways, pipelines, communications, power lines and other infrastructure and engineering structures. At the same time, a large share of new construction corresponds to the scale of the destruction, which is not subject to partial repair or reconstruction.

✓ **As we can see, there is a lot of work for builders, but what about training?**

— The construction sector already needs different categories of workers who would restore Ukrainian cities and villages. In this matter, attention should be paid to the preservation, support, and development of vocational and



*Irpin.
Repair of the house after the shelling*



Chernihiv.
Repair of the house after the shelling

technical education institutions in the field of construction, which are currently the base for training qualified workers.

It is also important to underline the role of free-of-charge two-week short-term courses of PROFBUD Union — I am talking about Hubs of informal vocational training of microskills in the construction sector. Hubs are focused on training the internally displaced persons (IDPs) who have lost their jobs, homes, moved to another region and need immediate retraining in order to get a paid job and be able to provide for their families. Other target categories are the unemployed, workers from other sectors of the economy, and the youth who want to acquire new professional skills in certain professions in the construction sector.

Based in vocational and technical education institutions, we have already held courses for the following professions: metal-plastic structures installer, plumbers, plasterboard structures installer, plasterer-tiler, painter-plaster. We are also implementing a joint project with an employer-company on training of specialists in the profession of “metal-plastic structures assembling”.

✓ **Currently, among the noticeable changes in the labor market is an increase in the number of women in traditionally male professions. Please comment.**

— Currently, during the war, there is a tendency for girls to be interested in professions such as welder, plumber, electrician, carpenter, etc.

On construction sites, more and more often we notice women who are gradually replacing men during mobilization. Although, even before that, women worked in construction, an example is female crane operators. It is important that today, in view of this aspect, the adaptation of working conditions took place. And this should happen not only in the construction industry.

✓ **What needs to be done to improve the current situation in the industry?**

— On April 9-10, 2024, the International Conference “Ukraine Reconstruction Conference 2024” was held in Warsaw (Poland). The event, organized by the Building and Woodworkers International (BWI) together with the Construction Union of Ukraine (PROFBUD), brought together representatives of 27 trade unions from 19 countries of the world, as well as representatives of the European Bank for Reconstruction and Development, the Central and Eastern European Office of the International Labour Organization, The Solidarity Center in Ukraine, the German Credit Institution for Reconstruction (KfW), the United States Agency for International Development (USAID), the Friedrich Ebert Foundation in Ukraine, the European Parliament, representatives of employers. The main purpose of this conference was to discuss the key challenges faced by the construction sector of Ukraine in the current conditions, to determine the needs for investments and the conditions for their attraction, to ensure safe and decent working conditions for builders and social guarantees, as well as to consider the tasks of cooperation for recovery and development construction sector.





Much of the discussion focused on how best to ensure that Ukraine can design and implement reconstruction projects in a way that ensures union participation and respect for workers' rights. Attention is focused on the inclusion of legislative norms on labor in the legislative and contract frameworks of reconstruction projects. We also talked about the importance of occupational health and safety in construction and the need to ensure the availability of a skilled workforce for reconstruction efforts.

Of course, it is difficult to find words to describe all the challenges caused by the war to the people of Ukraine, workers and trade unions. PROFBUD continues to do everything possible to unite and support construction workers and their families, as well as to rebuild Ukraine. Today, Ukraine faces the issue of ensuring mandatory compliance with many ILO Conventions on fundamental principles and rights in the field of labor, such as: Forced Labour Convention (No. 29), Right to Organise and Collective Bargaining Convention (No. 98), Occupational Safety and Health Convention (No. 155), Labour Clauses (Public Contracts) Convention (No. 94).

Also, a mechanism should be introduced, under which the financing and procurement of all construction and infrastructure projects would include budget allocations for inspections, professional training, and occupational health and safety measures.

During the process of harmonization of the legislation of Ukraine in the field of public procurement with the relevant EU directives, it is necessary to take into account the European Parliament and the Council Directive 2014/24/EU, February 26, 2014, on public procurement.

We should also pay attention that national policies and legislation should protect workers' rights and facilitate collective bargaining in accordance with ILO Conventions and EU legislation to further support the country's aspirations to become a member of the EU.

Therefore, it is necessary to act right now and implement all necessary changes in legislative and regulatory acts, improving the working conditions of construction workers.

✍️ We thank the Construction Union of Ukraine for the help in preparing the material



CONSTRUCTION UNION OF UKRAINE

A UNION IS:

-  Qualified legal aid
-  Protection of employees' interests
-  Influence on the enterprise social policy

WHAT WE DO:

-  negotiate wages for union members, conditions and terms of its payment
-  advice and help to conclude a written contract the conditions of which we can later control as a union
-  ensure control over working conditions and personal and collective protective equipment for union members according to legislation



WHAT SHOULD YOU DO:

- Apply to the Union
- Get your membership card
- Keep contact with your union representative





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FINNISH COMPANIES are interested in the restoration of Ukraine



Today, international business is ready to participate in the implementation of projects for the reconstruction of Ukraine and is aimed at a long-term perspective. About 60 Finnish companies took part in the ReBuild Ukraine event in Warsaw, Poland, in mid-November 2023. Among the directions Finland offered for Ukraine leading roles were given to expertise in the field of energy, construction, telecommunications, and smart environmental design.

Many Finns are eager to help Ukraine, and one concrete way to do this is participation in projects that restore the functionality of the country. Besides Finland, ReBuild Ukraine has united numerous companies from Europe, North America, and Asia. It also helps to create international communities and ideas for complementary cooperation.

The organization of the Finnish delegation to Warsaw was entrusted to Director Reijo Kangas from Business Finland. And the services offered by the delegation were col-

lected in a brochure, as a recommended to everyone who is interested in cooperation between Ukraine and Finland.

In order to learn more about the intentions and methods of participation of Finnish companies in the reconstruction of Ukraine, the editors spoke with the director of Business Finland (ed.: Business Finland — Finland's official government agency for promoting trade and investment, financing innovation, boosting travel and attracting talent) Reijo Kangas.

✓ What kind of values can Ukraine adopt from the Finns?

— The experience of Finnish companies in the field of sustainable energy production, ecological technologies and green construction opens wide opportunities for cooperation with Ukrainian communities and cities. Since Ukraine was greatly affected by Russian aggression, which caused significant damage to the environment, Finland also offers experience in cleaning up the contaminated environment and demining. Our technologies are high-quality and cost-effective. In many cases, they outperform competing solutions, such as using drones for mapping.

It is worth noting that our architecture, combining Scandinavian and modern styles, has solutions that take into account safety of living in harsh weather conditions, as well as the variability of life situations. In addition to residential buildings, we offer some of the best shelters in the world, functional and quickly assembled schools and kindergartens. We have also developed high-quality solutions for hospitals. Visitors come to Finland to see, in particular, our new children's hospital.

Finland is also one of the leading experts in the field of cyber security. Protecting critical infrastructure, such as energy systems and data networks, is critical for Ukraine today as it builds a functioning and secure society.

I am convinced that by combining Finnish technology and Ukraine's recovery needs, we can build a more sustainable and prosperous society for future generations.

✓ Do Finnish companies work in Ukraine?

— Some Finnish companies have been doing business in Ukraine for a long time. Among them is a crane manufacturer KoneCranes, paint manufacturers Teknos and



Tikkurila, supplier of transport and energy solutions Wärtsilä. The household waste collection company Molok and the waterproofing solutions company Katepal are also well known in Ukraine.

Due to the Russian aggression, the need for quick corrective services has increased, as well as increased interest in Ukraine among many companies that previously had no experience of doing business in the country. For example, industrial construction concepts such as mobile factories producing components are interesting solutions from a construction point of view. No less interesting is the Finnish experience in designing hospitals and schools. Also, I am sure that Finnish architecture and technical design experience will undoubtedly find their place in the reconstruction of Ukraine.

✓ What are the ways to cooperate with representatives of Finnish companies?

— Finns appreciate good networking skills, but you should prepare thoroughly before starting a collaboration. Finnish companies act responsibly: among the important values are ensuring the comfort of employees, fighting corruption, assessing risks, and striving for a low level of carbon emissions into the atmosphere.

We are still looking for answers to many questions: can we offer our companies export support and financing, what legal barriers might make it difficult to start cooperation, or safe construction, how can we advise companies to follow the travel advice for Finnish citizens?

If you look at the map of Europe, Finland is relatively close to Ukraine. There are daily flights from Finland to Poland, from where you can reach Ukraine by land transport. In addition, there is a road connection through the Baltic countries and Poland. There is an intensive ferry service between Finland and Estonia.

✓ What are the main features of the Finns as business partners and what business culture prevails in the country?

— Finland has been voted the happiest country in the world for six years in a row. Many things in Finnish society and government are well organized. The decision-making process is very transparent, and the level of corruption is the lowest in the world.

Finnish partners are reliable and friendly. They are happy to discuss business and approach the solution of even complex issues directly and openly. If there are problems with contracts, deliveries, or payments, you can openly resolve the issue with the Finns. They are very dedicated to their work and can talk about their company's business for hours.

Offer Finns your solutions and ideas, ask for their opinion, and you will make significant progress.

Photos: Business Finland

Learn more about the solutions from Finnish companies:



INDUSTRIAL METHOD OF CONSTRUCTION: A WHOLE NEW STAGE OF TECHNOLOGY DEVELOPMENT



Each construction technology has its advantages and disadvantages, supporters and opponents. Today, industrial home construction found itself in a difficult situation. For many, the words «panel building» is still associated with something low-quality and unreliable. But today, modern industrial construction around the world is based on flexible technologies. After all, factory wall structures guarantee the quality and high speed of construction, and aesthetics are achieved by applying various architectural solutions.

Advantages and disadvantages

In Soviet times, large residential areas were built on the basis of panels. And 90 per cent of them have an unattractive, gloomy appearance. It is no wonder that many began to think that the era of panel building is coming to an end. But it is not so. In European countries, such housing occupies a significant share of the market. It is built using advanced technologies in accordance with modern standards and requirements.

In Ukraine, these technologies are also spreading and undergoing a kind of "rebirth" stage. Moreover, it is important that the local authorities used to be the customers of such projects, but now mostly private developers are.

The reasons are obvious: new series have entered the market, and significantly changed the aesthetics of the building for the better. At the same time, new technologies of industrial construction have opened opportunities for flexible architectural solutions. This means that projects are developed individually, and production can be reformatted in a very short time according to emerging needs. That is, the same production line can be used to produce various structural elements of a wider range and required sizes. Also, if earlier 12-16-22-story buildings with a standard set and con-

figuration of apartments were built, now you can build objects of any number of floors and of any shape. The set of apartments in such houses can also be chosen. They are comfortable to live in, and the previous complaints about poor thermal insulation and high level of noise have been corrected. In other words, typical panels of the 70s and 80s and modern houses using industrial construction — are heaven and earth. And it concerns all the aspects, starting from the appearance and ending with operational characteristics.

Industrial home construction has other advantages — each house does not need to be designed from scratch, manufacturing parts and structures in factory conditions allows you to significantly speed up the construction period under the conditions of maintaining high quality.

Of course, this technology has a number of factors that act as a certain limitation. For example, in traditional panel buildings, it is impossible to create premises on the first floors with high ceilings for the accommodation of small businesses, so it is necessary to find a non-traditional approach and, for example, design the two lower floors from monolith reinforced concrete and the following ones — using industrial construction technology. It is also difficult to make entrances to porches without high thresholds, etc., which seems to complicate the construction technology, but

is not impossible. However, these difficulties are completely surmountable by foreseeing relevant solutions in the project.

Regarding production capacity, unfortunately, today the number of producers is lower than the one that was before. Currently out of 85 enterprises no more than 5 are active on the market, and modern. Buring the boom of the industrial method of construction in the 50-60s of the last century happened during the peak of the development of a whole network of house-building factories that produced ready-made wall structures. With the collapse of the Soviet Union, this story ended — such factories began to close down widely due to lack of demand and economic impracticability. First of all, this situation happened due to a significant increase in the cost of the production process, the primary cause of which was the high cost of electricity. After all, as everyone knows, during the USSR times, electricity “didn’t cost anything”, so many production processes were not expensive for enterprises. In current conditions, without modernization and the application of new technologies that allow optimizing the panel manufacturing process, it will be unprofitable.

Modern technologies of precast concrete and industrial construction make it possible to manufacture structures quickly, reliably, of appropriate quality and with high performance indicators, which makes it possible to solve tasks of various complexity facing the construction industry.

Expert comment

Industrial construction is surrounded by many myths. Also, in order to understand in more detail the nuances of the technology, we turned to leading industry and science experts to comment on their vision of the situation in the segment of housing construction by industrial method.



Anatoliy Berkuta, Vice-President of the Construction Chamber of Ukraine, Vice-President of the Academy of Construction of Ukraine:

— The current question regarding the utility or impracticality of building residential objects from industrial structures is, in my opinion, out of time. After all, there is no point in discussing this matter. This issue is understood, and the engineering community has been working on this problem for many, many years.

First of all, let’s go back to the historical aspects. Clearly, after the end of the World War II, the country had to look for ways to provide the population, first of all, with housing facilities, and then with social facilities. We started with what we understood — we need to build something simpler in order to also provide temporary accommodation. So, the first brick houses, which were five stories high, were usually designed for about 30 years of operation. It was planned to replace them later with something more comfortable and acceptable from the architectural image point of view.

Over time, it became clear that the problem would not be solved quickly in this way, and they began to think about new approaches to construction. One of the accepted options was to produce ready-made large blocks of bricks at the production sites for their subsequent assembly at construction sites. These were the same five-story buildings, but fewer



workers were involved in their construction on the construction site, because the main processes took place in the workshops, where masons formed blocks of bricks.

Unfortunately, this approach turned out to be a rather labor-intensive process, and it was concluded that all this can be done from concrete by forming concrete panels. Initially, they were formed from “heavy” concrete which involved significant costs for cement and reinforcement during production and issues with energy efficiency during the operation of ready-made buildings. Later, light concretes, more energy-efficient cellular concrete began to appear. Also, the construction technology itself caused many problematic issues. In particular, there was significant leakages, especially in the end sections and even blowing between the panels. Of course, this was only the beginning of such industrial construction, but it made it possible to solve the problem of providing housing more quickly. At the same time, more and more work began to be transferred from the construction site to the production shops. Most products were manufactured on factories, and only their assembly took place on the construction site, which allowed to increase the volume of construction.

For example, if we look at the 1987 indicators, the largest amount of residential construction was built in that year — 21.3 million m² of housing, of which: 5.5 million m² was built by people themselves, 14.8 million m² was built by the state organizations that relied on industrial construction, 1.3 million m² was built by cooperatives, 1.4 million m² was built collective farms. At the same time, the capacities for 1987 were also significant: 50 house-building factories, 24 large-panel construction enterprises and 3 factories that produced industrial structures.

Now we all see that it was a quick construction and such houses have many flaws, but this does not mean that this technology is not worth paying attention to. The main thing is to have a modernized approach and make the most of new technological opportunities. Today, there are already new constructive solutions, they are prefabricated, they are assembled in factory conditions, able to withstand loads that old panel houses could not bear, etc.

Also, to say that industrial construction should be abandoned, identifying it as panel building, is absolutely wrong. It is quite competitive and can coexist with other housing construction technologies. And taking into account the scale of destruction that Ukraine has at the moment, there is a lot of work ahead. We have a large state and a large territory,

so it will be necessary to build housing not at the pace at which we can build today, but much faster. Therefore, it is worth calculating the relevance of certain construction methods.



Hennadiy Fareniuk, Doctor of Technical Sciences, professor, director of the State Scientific and Research Institute of Building Structures:

— Today, it is a common opinion that panel houses are less resistant to seismic fluctuations and dynamic influences than other structural systems. In fact, this is not the case. Constructive systems of multi-story panel buildings provide the necessary stability due to their flexibility and, providing necessary quality of connections between the panels, buildings are able to perceive dynamic loads and extinguish them. The main thing, as in other technologies, is the quality of the panel installation work.

By the way, equally disputable is the question of the degree of damage and destruction of panel buildings during military impacts, which, unfortunately, is the most relevant for our country. Based on the results of research into damaged and destroyed buildings conducted by our institute in 2022-2023, it can be stated that the destruction of the structures of large-panel buildings is not greater than in monolithic frame buildings. But this is a general conclusion, detailed research and analysis of destruction in buildings with different structural systems has not yet been carried out, and these issues require special study.

In general, from the point of view of the speed of construction and the quality of construction works, with their proper organization, industrial construction has its advantages. First, the production of panels at the factory can be carried out regardless of the season and weather conditions. The stability of the quality indicators of each batch is also ensured, because in factory conditions it is easier to carry out quality control of finished products, strict compliance with technological requirements, and ultimately, control of materials and raw materials used in the production of structural elements. Modern production is automated and unified, which reduces the human impact. In addition to availability of panel production in any weather conditions, the industrial construction method also has greater season adaptability in terms of installation, which is also important.

Among the biggest problems of this technology is ensuring the necessary operational properties of the joints of the panels. However, currently, there are enough high-quality solutions on the market to ensure a proper joint and the necessary air and water tightness characteristics.

The question of the influence of air permeability on operational properties is much broader than only the air permeability of joints. These issues are also urgent for the existing constructive systems of facades of monolithic frame buildings. For facade insulation of buildings with external walls of two or two and a half bricks, air tightness through the structure is ensured with the proper fulfillment of the requirements for the seams of the existing masonry. With modern solutions, the walls are filled between floors in one brick or a block without proper preparation of the joints, and the pres-

ence of insulation does not provide the necessary characteristics regarding air infiltration and, accordingly, regarding the thermal insulation properties of the external walls.

In industrial construction, such problems do not arise, and the main thing is to comply with technical requirements, both in the process of manufacturing and installation of finished products.

During the production of large-format panels, they are insulated and furnished at once. After a full cycle of factory work, such three-layers panels are delivered to the facility and installed. Therefore, it should be emphasized that the current level of panel house construction and modern technologies of precast concrete make it possible to build houses with high operational characteristics that fully meet the modern requirements of engineering and technical support and energy saving. At the same time, they are distinguished by a variety of layouts and external architectural expressiveness.

As for the regulatory framework, in Ukraine it is formed and covers all issues of design, production, quality control and compliance, the main thing is that the current regulatory requirements are fulfilled.

So, taking into account the above, we can say that the industrial method of construction can become a reliable assistant in the rapid restoration of destroyed housing, but at a completely different level. It is only important comply with a few key things: prepare the projects of mass application and a clear system of control over the execution of work directly on the construction site. Otherwise, it will not have the proper effect.

China can serve as a vivid example of the active use of industrial construction. We all have heard about their records of building high-rise buildings in literally 20 days. Moreover, they build entire blocks using standard designs. But looking at the Chinese construction experience, special attention should be paid to how they carry out quality control, both of the materials themselves and of the work execution process.





Petro Shilyuk, Hero of Ukraine, Honorary President of DBK-Zhytlobud Corporation, President of the Construction Chamber of Ukraine:

— Once upon a time, industrial house building was a priority in Ukraine. So, if we take the period up to the beginning of the 60s, when the program for the intensive provision of housing to the population was working, there were at least three house-building factories in each regional center. In comparison,

in Soviet times we built 24 million m² of housing, while during independence — a maximum of 11 million m².

A whole new stage in the development of industrial housing began with the implementation of State Building Norms B.2.6-31:2006 “Thermal insulation of buildings” in 2007. During the further development of the projects, full compliance with modern heat engineering requirements was ensured and all the shortcomings characteristic of residential buildings of the first mass series were prevented. A calculated assessment of thermal characteristics was carried out for typical block-sections of industrial buildings of the modernized series. The junctions of wall structures which were critical from the point of view of heat engineering, have undergone a thorough inspection for compliance with regulatory requirements. Therefore, modern “warm panel houses” — is not only a stable comfortable temperature in living spaces, but also a significant reduction of harmful CO₂.

For example, in Europe, prefabricated technologies are constantly developing, combining traditional advantages — speed and less influence of weather conditions on the construction process — with high quality of structures, which

allowed them to take a prominent place next to monolithic and frame-monolithic construction technologies.

Our task is to catch up with the Europeans, who are one step ahead in panel housing construction. Its very essence remained unchanged, but the tools and the result changed. Moreover, this technology can become the main resource for increasing mass construction, however, only in condition of modernization of plants of reinforced concrete products and house-building plants. And this is possible under the condition of developing a mechanism of sustainable lending and appropriate legislative framework. For the wider development of this direction, it is better to have a relevant state program.

Unfortunately, we often follow fashion, including in construction. For example, monolithic-frame construction technology began to be used more and more often. This is a fairly modern technology that has its advantages, but it is also worth considering the fact that most of such objects in Ukraine are performed by companies that do not have their own production base. Which quite often affects the quality of work and the guaranteed completion of construction and putting it into operation. Equally important is the fact that the majority of such housing appears to be unfurnished. So, if we talk about the economic component, it is doubtful.

For example, it takes an average of two years to build a house using industrial technology. It is a ready-made multi-storey building with elevators, roof, ventilated facade, internal fittings and engineering. In other words, you can bring the furniture and live. Of course, you can build a monolithic frame house in two years. But after receiving housing, its owner has to bear almost the same expenses for furnishing that was spent on buying “square meters”. Usually, such houses are put into operation without internal equipment, or with minimal equipment. So, if we take the material costs of building a house, there is also a noticeable difference. For comparison: reinforced concrete is used in industrial con-



struction at approximately 41 kg/m^3 , while in monolithic frame construction — up to 200 kg/m^3 .

Among the most common advantages of monolithic frame construction is free planning. Yes, there is no such advantage in a house built using industrial construction technology, but this does not mean that such houses are all of the same type.

In general, modern industrial construction is a kind of high-tech designer: the elements are the same and unified. As for the single type of buildings, this issue has long been resolved — today there are no problems in making high-rise industrial buildings modern and architecturally expressive. And this is primarily because, from typical structures, we build houses that are individual in terms of architectural solutions and attractive from the outside.

At the same time, the thermal reliability of buildings is ensured by effective thermal insulation, one of the elements of which is the facade system. To ensure modern energy efficiency requirements, we use the HOSTROCK curtain wall facade system, the full cycle of manufacturing and installation of which is carried out by one of the corporation's enterprises, the Sonet plant. In general, it is quite important when the factory and the construction and assembly departments, which build houses from industrial structures, are links of the same chain, then they are bound by joint responsibility. For example, our corporation consists of 11 powerful organizations that professionally perform design, construction, electrical installation, commissioning, finishing works, installation of elevator equipment, manufacture concrete and reinforced concrete products, organize the territories, and maintain buildings after commissioning.

A complete closed cycle of production within the framework of one enterprise — this mechanism is unique for Ukraine, because today, even among large developers, there are not so many enterprises capable of sustaining the entire construction process on their own.

Our houses of the modernized APVS series with a ventilated facade are a clear example of housing design and construction, the heat losses of which are reduced to a minimum.

Unfortunately, today there are quite a few enterprises that work with the industrial construction technology. Moreover, in order for it to be modern, it is necessary to invest a lot. And not all manufacturers are ready to take such a step. For example, our corporation purchased an industrial line for production, which is modern for Ukraine today, but if you take Europe, it is equipment that has been used there for a long time and is popular. It has software, zero-waste production and variability in product manufacturing. Unfortunately, there is only one such line in Ukraine. But this is not a reason to bury industrial construction. It will be able to take its place in the reconstruction and provide high-quality and comfortable housing in a relatively short period of time. At the same time, it is important to adhere to the principle that the building should not be put into operation as a "semi-finished product", but with all the finishing works provided for by the project.

Royal House press service:

— It is worth noting that modern precast concrete differs from Soviet-style panels to approximately the same extent as Mercedes from old Zhiguli. The panels used today are five times more energy efficient. Thermal insulation is laid in a continuous carpet, which makes it possible to avoid the "cold bridges". The absolute strength of the structure is achieved immediately after its installation. Sealing of external seams is provided by modern technology of panel joints. In fact, houses using prefabricated monolithic technology are "built" at the factory, and are installed in the position already on the construction site.

In general, prefabricated monolithic technology undoubtedly has a number of advantages, including:



- the cost of construction when using prefabricated wall modules is reduced by 25-35 per cent (compared to monolithic frame technology);
- construction terms are halved;
- the use, for example, of clinker on the facade extends the service life of buildings;
- construction and installation are possible at any time of the year. All “wet” processes take place in advance in the plant’s workshops.

For example, in European countries, industrial panel house construction is widespread, in particular, it is quite common in residential construction. Popularity is explained by high consumer features (and at the same time economy) — in fact, by what the consumer most often values.

Although it is worth noting that in Europe there are quite high requirements for the quality, environmental friendliness, and energy efficiency of residential buildings. We felt it when we entered the European market. We can say with confidence that the wall modules with an energy-efficient insulation system of the Royal House group of companies fully meet European quality and energy efficiency standards, and the implemented projects in Europe show the high trust of European customers in the Ukrainian product. Among the greatest advantages of TM Royal House wall modules, thanks to which they conquered the heart of Europe, is an energy-efficient insulation system that exceeds Ukrainian standards by 20 per cent. That is why the houses built according to this technology are very warm, which allows you to save up to 55 per cent on heating the premises (data based on the example of the completed project of the residential complex “British quarter”).

Current tasks of increasing the volume of economically efficient construction require new solutions. Modern industrial



house construction can be such a solution. After all, modern industrial construction technologies will make it possible to diversify the industry, reduce capital costs, and at the same time significantly reduce the scope of work and the associated risks. And perhaps the main advantage of this method is the transfer of most technological processes from the construction site to factory conditions. This will make it possible to control the technological processes more carefully, and therefore increase the quality of finished houses. So, as we can see, there are practically no real alternatives to industrial housing construction to solve the problem of mass construction of affordable and high-quality housing.



Royal House: Ukraine has the technology to rapidly rebuild its nation's homes



Rebuilding destroyed housing is one of the key tasks for the reconstruction of Ukraine. The hostilities are still destroying cities and villages. Millions of internally displaced people and refugees in EU countries have no homes to return to. The Kyiv School of Economics estimates that nearly 90 million square meters of land have been destroyed or damaged as of January 2024. This area comprises 8.6% of Ukraine's housing stock. This figure is expected to rise as the war continues. It is estimated that more than 1.4 million households, which were home to 3.4 million people, have been damaged or destroyed at a cost of nearly \$60 billion.

The European Community is discussing how best to rebuild Ukraine's infrastructure and housing stock. Turkey, Poland, Germany and other countries have declared their readiness to participate in reconstruction.

However, Ukraine has its own resources available to solve this problem. The Ukrainian company Royal House has developed and introduced TM Royal House, a unique certified wall module-based construction technology.

This article explains how the latest industrial construction technology can play a key role in rebuilding Ukraine's homes.

Modern technologies

Ukraine faces an acute need to rebuild a huge number of apartments. Therefore, identifying methods for rapid and high-quality construction is crucial. The problem is partially solved through temporary modular houses. But the lifespan of such buildings is limited, and mass apartment rebuilding requires a more systematic approach. To motivate Ukrainian refugees to return, the government needs to ensure their well-being and provide high quality housing.

The scale of the destruction is so great that many countries have expressed their willingness to help rebuild infrastructure and housing. But amidst these offers of help, the Ukrainian voice is often overlooked.

However, Ukrainian developers have a great deal to offer. They have already developed and introduced a construction technology that can compete with those of interna-



tional development companies. We're referring to industrial construction technologies and modern panel buildings, not outdated, grey, archaic panel blocks. The new approach has proven itself to be efficient and reliable both in Ukraine and across the EU.

This technology has been endorsed by Professor Hennadii Farenjuk, Director of the State Research Institute of Building Structures. Professor Farenjuk has praised the speed and quality with which new structures can be built. Factory production enables work to continue all year round, irrespective of the weather, and makes it easier to monitor the quality of the final products

The monotonous appearance of buildings is no longer an issue thanks to the latest technologies. Modern and architecturally innovative high-rise buildings can be developed while ensuring that industry standards are consistently met.

Ukrainian and EU experience

Ukrainian developers actively employ industrial construction technologies. The Royal House company has developed and patented its own method of erecting modern prefab houses from wall modules that it produces in-house.

Royal House wall modules comprise a load-bearing reinforced concrete wall plate (length up to 11,000 mm, height up to 3,120 mm, thickness 160 mm), an insulation system (reinforced polystyrene foam and mineral wool) and facade finishing. Load-bearing reinforced concrete units are produced, insulated and decorated in factory conditions, with each stage of production subject to quality control.

When using the Royal House construction technology, residential buildings are effectively built at the developer's own factory in dry and warm workshops. They are only erected into their design position at the construction site. Using this technology, Royal House has already constructed



From left to right: Oleksii Bilokon, Royal House commercial director, Hennadiy Farenjuk, Director of the State Research Institute of Building Structures, Vitalii Ganzha, President of the Royal House Group.

more than 500,000 square meters of housing and will double this figure in the coming years.

One of the key advantages of the Royal House wall module construction technology is its speed. For example, in the new Oxford residential complex, Royal House was able to complete a nine-story multi-apartment building in just six months.

The technology developed by Royal House has been used to construct the "New England" housing development in Kyiv. This project took place in 2022-2023, and resulted in the construction of two residential buildings, comprising more than 1,200 apartments, complete with underground parking.





The company was one of the first in Kyiv to resume construction after the start of the full-scale invasion. Already in the fifth week of the war, work on the New England housing block construction site was in full swing. Royal House managed to preserve jobs and fulfill its obligations to investors. As of early 2024, New England has four buildings at various stages of construction.

The technology developed by Royal House has also been successfully used outside Ukraine. The company has completed three projects in Slovakia, and one project is currently underway in Austria. The developer has obtained a certificate of manufacturing compliance for the Royal House wall module, which complies with the harmonized European standard EN 14992: 2007+A1:2012, and has patented the technology in the US.

Therefore, Ukraine has its own resources and technologies to solve the problem of mass rebuilding of damaged housing. Ukrainian developers and specialized institutes are able to offer experience and expertise and have proven themselves to be a reliable partner for the Ukrainian Government to work with.



“The construction projects and housing blocks which we have completed using our technology can become a useful model and example for large-scale and high-quality reconstruction of Ukraine. The use of modern industrial construction technologies will make it possible to quickly provide millions of Ukrainians with high-quality, comfortable and modern housing,” stressed Vitalii Ganzha, the president of the Royal House Group.

Oxford housing block in Chaiky village, Kyiv Oblast

Oxford is a housing block located in a quiet suburb, making it an ideal place for a peaceful life. The apartments are conveniently located near to a local park which provides the perfect place to socialize with friends and family.

It takes 30 minutes to get to downtown Kyiv by car, and the nearest subway station can be reached by public transport in 25 minutes. The development is also well connected to Zhytomyrska Highway, Okruzhna Street and Beresteysky Avenue, making trips to the city even more convenient.

Once completed, the development will comprise 15 buildings, each containing nine stories, over 14 hectares. One- and two-room apartments with a convenient layout will be available in the new development. The housing block is designed according to the principle of a 15-minute city, where everything that makes life comfortable is within walking distance: shops, cafes, pharmacies, and other local amenities. Landscaping and greenery are planned for the outdoor space. A public school is located within the Oxford housing block as well.



PARK ROYAL housing block in the city of Bucha

PARK ROYAL is a comfort-class block, comprising 25 hectares, in one of the greenest suburbs of the capital. This development offers residents a park city experience, complete with their own sports and recreation areas. The project will involve the construction of 23 buildings, ranging from seven to 16 stories in size. The apartments will feature diverse layouts: from functional studios and one bedroom apartments to spacious penthouses with expansive rooms and private courtyards.

A central feature of PARK ROYAL will be a promenade spanning more than 17,000 square meters. This will be a hub of vibrant activity, offering residents a wide range of amenities

including: restaurants, cafes, food stores, beauty salons and much more. Almost 6,000 square meters have been set aside to provide space for children to play and socialize with their friends. True to its name, the development will include a Garden Plaza, complete with its own glasshouse. This will be complemented by an Urban Plaza containing an amphitheater. In the summer, this will provide space for film screenings along with festivals and concerts. In winter, the space can accommodate snow slides and Christmas decorations.

The PARK ROYAL development prioritizes residents' safety. All first phase buildings are equipped with bomb shelters built to meet national building regulations.



Annual business meeting of concrete and reinforced concrete market experts



On February 15, 2024, a business meeting of concrete and reinforced concrete market experts was held as part of the KyivBuild exhibition. The topic of the meeting was: «Perspective directions, technologies, innovations and opportunities.» This is an annual event that is traditionally organized by the editors of ProfBuild magazine with the support of the KyivBuild team, general partner «Penetron Ukraine» and business communities of the industry.

Innovative technologies and changes in the market

The business meeting was opened by **Svitlana Shakh**, founder and editor-in-chief of ProfBuild, welcoming all participants and thanking them for their interest in the event: «The concrete and reinforced concrete market is constantly developing, which opens up new opportunities for the construction industry and contributes to improvement of the quality and stability of building structures. For example, green production technology is becoming more and more widespread today; the use of nanomaterials to improve the strength, resistance to environmental influences and other properties of concrete; the use of 3D printing technology for the manufacture of complex concrete parts and structures, which allows for faster and more efficient construction; artificial intelligence and IoT sys-



tems are being implemented for constant monitoring of the condition of concrete structures and automation of construction project management processes, etc.»

Also, the editor-in-chief of ProfBuild noted that today it is extremely important to continue working and support the country's economy. Words of gratitude were addressed to all those who today protect Ukraine and bring Victory closer.

Oleksandr Chervak, executive director of the Confederation of Builders of Ukraine, joined in the welcome speech. He noted the importance of such meetings and thanked ProfBuild for their support to the construction industry. He also reminded that at the end of December 2023, the KBU held a round table «Cement: opportunities and challenges for producers and consumers.» It is known that concrete and cement are among the TOP-10 construction materials, the production of which is the most attractive for investment when launching a large-scale reconstruction and modernization of the country. After all, the total annual volume of concrete is about 13.6 million tons on average, while for large-scale reconstruction, according to preliminary estimates, it is about 35 million tons. At the same time, the construction share of GDP before the full-scale invasion averaged from 2 to 4 per cent, of which concrete is about 0.4 per cent.

Oleksandr Chervak has also announced a large-scale



event — Recovery Construction Forum Ukraine, which will take place on April 11, 2024, in Kyiv at the Parkovy Center. The event will bring together government officials and the construction community to discuss current industry challenges and effectively coordinate efforts to rebuild Ukraine.

Summarizing his speech, the executive director of KBU once again emphasized the importance of discussing the issue of concrete and cement products, especially in our time, and wished the participants an active and interesting discussion.

The business program of this year's meeting began with innovative technologies presented by the director of «Penetron Ukraine» **Olha Vorona**. Let us remind you that the company «Penetron Ukraine» is the official representative of Penetron TM in Ukraine and supplies Penetron crystalline materials and a wide range of materials for restoring concrete and arranging and protecting floors. In particular, in her report, Ms. Olga, in addition to a detailed introduction to the specifics of the use of Penetron materials, showed the results of their use on real objects in Ukraine.

Volodymyr Yarimovskyi, director of development of PAU Group (Building Materials Market Agency) conducted an analysis of the state of the construction market and construction products. Among the main theses:



1. For 9 months of 2023, the real growth index of the construction market was 21 per cent. At the same time, the infrastructure segment showed growth of 34 per cent and non-residential construction — 14 per cent. Unfortunately, residential construction showed a decline of 4 per cent compared to 2022 figures.

2. The volume of the construction market in 2023 is estimated at at least UAH 164 billion, which is a drop of 58 per cent compared to the figures of 2021.
3. Among the factors restraining construction activity: financial constraints (45 per cent of respondents), insufficient demand (30 per cent) and lack of workers (30 per cent).
4. The building materials market for 9 months of 2023 showed an increase of 21 per cent compared to the indicators of 2022.
5. The volume of the building materials market in 2023 was estimated at 123 billion UAH, which records a drop of 57 per cent compared to the figures of 2021.
6. The top-regions consuming the largest share of building materials in 2023 were: Kyiv, Lviv, Vinnytsia, Ivano-Frankivsk, Odesa and Zakarpattia regions. They accounted for 66 per cent of the total volume.

7. Among the outsiders of the building materials market: Donetsk, Luhansk, Zaporizhzhya, Kherson, Mykolaiv, Sumy and Chernihiv regions.
8. The concrete and reinforced concrete market for 9 months of 2023 showed an increase of 18 per cent, the total volume of the market is estimated at 9.7 million tons.
9. If we compare prices in December 2022 and December 2023, the cost of ready-mixed concrete on the retail market has increased by 26 per cent, on the wholesale market by 7 per cent. At the same time, the cost of reinforced concrete on both markets increased by 24 per cent during the considered period.



Construction materials market trends 2023* vs 2022

Growth +21%	Infrastructure +34%
Market volume UAH 164 vs 115 billion	Non-residential construction +14%
Structure 2023 60% 25% 15%	Residential construction -4%
Structure 2022 53% 27% 20%	
For reference, 2023 vs 2021:	Factors** influencing the companies:
Decline -58%	• financial limitations 45%
Market volume UAH 258 billion	• lack of demand 30%
Structure 2021 60% 25% 15%	• lack of workers 30%

*Estimated based on official statistics for 9 months 2023, index of construction products (real index of growth/decline)
 **What is holding back construction activity, based on the results of a survey of 305 construction enterprises in January 2024 (Survey of the State Statistics Service)

Construction materials market trends 2023* vs 2022

Growth +21%	TOP regions (consumption share 66%)
Market volume UAH 123 vs 86 billion	• Kyiv region
	• Lviv region
	• Vinnytsiya region
	• Ivano-Frankivsk region
	• Odesa region
	• Zakarpattia region
For reference, 2023 vs 2021:	Outsider markets:
Decline -57%	Donetsk region, Luhansk region, Zaporizhzhya region, Kherson region, Mykolaiv region, Sumy region, Chernihiv region
Market volume UAH 182 billion	

*Estimated based on official statistics for 9 months 2023, index of industrial products by type of activity (real index of growth/decline). The regional consumption is calculated by the input structure of different types of buildings.

Concrete and reinforced concrete market trends 2023* vs 2022

Growth +18%	Ready-mixed concrete, price growth:
Market volume 9.7 vs 8.2 million tons	• Wholesale market: +7%
Structure 82% 18%	• Retail market: +26%
	Reinforced concrete, price growth:
	• Wholesale and retail market: +24%
For reference, 2023 vs 2021:	
Decline -60%	
Market volume 24.3 million tons (UAH 23.6 billion)	

*Estimated based on official statistics for 9 months 2023, index of industrial production by type of activity 23.6 (real index of growth/decline). Price growth December 2023/December 2022 according to the platform <http://upbau.com.ua/ua/>

The next speech concerned the conditions for putting construction products into circulation on the Ukrainian market in accordance with the Law of Ukraine «On Providing Construction Products on the Market» which implements the provisions of EU Regulation No. 305/2011.



Oksana Sak, deputy director of the Bureau IRIS LLC, reminded of the main legislative documents on conformity assessment of construction products that are in force in Ukraine today. In particular, the Law of Ukraine «On Technical Regulations and Conformity Assessment», adopted on January 15, 2015, which replaced the Law «On Confirmation of Conformity» (2001) and the Law «On Technical Regulations and Conformity

Assessment Procedures» (2005) (entered into force on February 10, 2016); Technical regulation of construction products, approved by the Resolution of the Cabinet of Ministers dated 20.12.2006 No. 1764 and developed taking into account the requirements of Council of Europe Directive 89/106/EEC dated December 21, 1988 (replaced); The Law of Ukraine «On Providing Construction Products on the Market», adopted on September 2, 2020

(entered into force on 01.01.2023). At the same time, she focused on the fact that the technical regulation is a normative legal act, which defines the characteristics of products, or the processes and methods of production related to them, including the relevant administrative provisions, observance of which is mandatory.

Regarding the question of whether a particular construction product is subject to the Act «On the provision of construction products on the market», Ms. Oksana spoke in detail about the main steps of the manufacturer and explained the main provisions of the Resolution of the Cabinet of Ministers of April 28, 2021, No. 426 «On approval of the list of categories of construction products».

In conclusion, the deputy director of the Bureau IRIS LLC underlined a number of key points, namely:

1. The purpose of conformity assessment is to demonstrate that all products comply with applicable legislation.
2. The manufacturer is always responsible for the conformity assessment/determination of technical acceptability.
3. The manufacturer also remains responsible when part of the conformity assessment is carried out by the competent authority.
4. The manufacturer is responsible for:
 - taking all measures necessary to ensure product and production compliance, including compliance assessment;

- compilation of technical documentation for products;
- drawing up and signing a declaration of construction products indicators;
- affixing a sign of compliance with technical regulations;
- putting the identification number of the designated authority next to the sign of compliance with technical regulations (if required by the system of evaluation and verification of the stability of indicators).



Lyudmila Kripka, executive director of the Association of Cement Manufacturers of Ukraine «Ukrcement», continued the topic of implementation of the Law «On providing construction products on the market» and showed the current situation in the cement industry of Ukraine and its opportunities, using the example of the indicators of the Association's participants. In particular, cement production by Ukrcement members in 2023 increased by 37.5 per cent compared to 2022 and amounted to 7.4 million tons. Although, 2022 is not indicative and has a low base for comparison. If we compare the data of 2023 and 2021 (11 million tons), we will see that there is still a significant gap.

Regarding the export/import of cement, according to Lyudmila Kripka, local production shows a fairly steady demand from other markets, which proves the competitiveness of domestic products. For example, 2023 was the best indicator of export volumes in the last five years.

Among the positive news of the current year is that in January the cement industry of Ukraine reached the level of January 2021. As for consumption, in recent years slag cement has been in increasing demand.

Lyudmila Kripka also underlined that the cement industry is one of the first ones to actively implement European standards. As a result, all European standards using the cover method are currently in effect, and standards in Ukrainian are accepted and put into effect. In addition, according to the information of cement manufacturers of Ukraine, «Cement Cards» are being developed for the consumer regarding the composition, characteristics, properties and use of cements produced according to State Standards (DSTU) and EN. This should increase the culture of consumption and avoid many mistakes when using cement.

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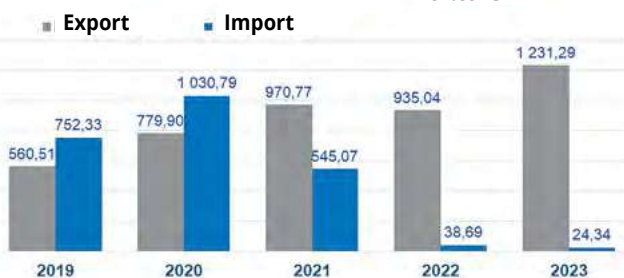
Digitalization of concrete and reinforced concrete business

The next part of the business program was devoted to issues of digitalization of concrete and reinforced concrete

Cement Export/ Import



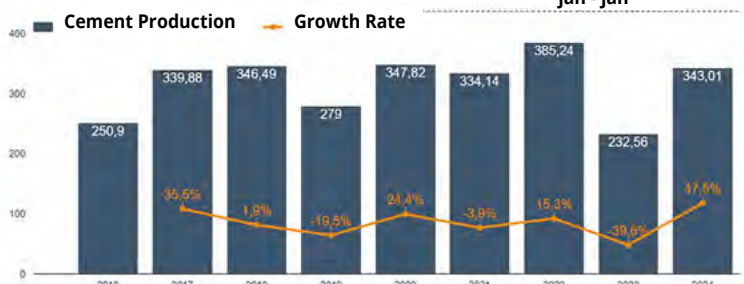
th.tons



Cement production by «Ukrcement» participants by years, January, th. tons. %



jan - jan



business, as means of increasing profitability and productivity. **Volodymyr Sobolev**, marketing director of the Kovalska Group, using the example of a renewed approach to issues of the company's product sales, showed step by step the entire process of implementing automation of various levels of interaction between the «contractor/customer». At the same time, he named the main stoppers on the way to digitalization of the concrete business, in particular:

- Construction depends on factors beyond our control, such as: weather conditions, changes in customer plans, etc.
- A custom of working «on call», developed by the company's clients and employees over the years.
- There are no ready-made solutions in our field of business that can be used.
- Technical unreadiness of some customers to use digital services.



The speech of **Ihor Boyko**, commercial director of UMT, continued the topic of modernization of concrete and reinforced concrete business. He presented his company's decision on digitalization of concrete mix delivery management. After all, the process of delivery of concrete mixtures is complex, dynamic and requires increased attention. The quality of transportation directly affects the quality of raw materials. Also, such a specialized solution for concrete mixers makes it possible to automate the process of monitoring the continuous rotation of the

mixer in the process of transporting and unloading concrete, routes and timeliness of delivery, which is so important in the construction industry.

The UMT representative also noted that a certain trend has been noticed in the last few years: the market no longer has enough «classic» solutions for monitoring and controlling transport. And it's not just «we decided that way», this fact is confirmed by almost all companies with which UMT works. At the same time, basic control tools are still popular. But there is one important thing: in the format in which they are used, they, unfortunately, do not bring the financial results that customers expect. A simple conclusion is that it is not about tools, but about the ability to use them. Therefore, it is worth changing this situation, and the UMT company is ready to help businesses and top managers who are looking for light at the end of the logistics tunnel.



Next, **Artem Honcharenko**, CEO of the Reconstruction Agency of Ukraine, head of the Reconstruction and Development Fund of Ukraine, presented the practical experience of using concrete and reinforced concrete in reconstruction and civil defense. For example, he talked about several real cases of already installed protective structures, and also focused on the use of particular glass in windows, the one that is able to withstand an explosive wave of a certain force.

Artem Honcharenko also focused on the topic of helping those who are currently defending our Ukraine from the enemy: «The war in Ukraine continues, and every day our fighters risk their lives defending our land. Unfortunately, war inevitably leads to injuries, and it is mobile hospitals that become the first line of lifesaving on the front.





Why are mobile hospitals so important?

- Speed: Mobile hospitals are located as close as possible to the front line, which allows for quick assistance to the wounded. This significantly increases the chances of survival, because the first hours after injury are the most critical.
- Qualified assistance: Mobile hospitals are equipped with modern equipment and staffed by highly qualified doctors who are able to provide assistance in case of any injuries.
- Evacuation: If necessary, mobile hospitals can evacuate the wounded to stationary medical facilities.
- How can we help mobile hospitals?
- Donate: We can help mobile hospitals by donating to their needs. It can be funds for the purchase of medicines, equipment, or other needs.
- Volunteering: We can become volunteers in mobile hospitals. Volunteers can help with transporting the injured, caring for them, or with other tasks.

Mobile hospitals are real lifesavers at the frontline. We must support their work in every possible way.»



Serhii Denysyuk, technical director of Karmel LLC, based on the company's experience and all stages of production development, told the participants of the meeting about what needs to be done to adjust the company's work in accordance with the requirements of European standards. Let us remind you that the KARMEL company is a leading manufacturer of equipment for the production of concrete.

Building Information Modeling (BIM) is increasingly being used in construction. First of all, it is a method of working integrated and optimized processes of develop-

ment, construction and operation of buildings and real estate objects. Complexity is taken into account here, that is, specialists of all departments work in one organization and in one



computer network, constantly exchanging data with each other. **Yuriy Smirnov**, director of Allbau Softer LLC, explained in detail the effectiveness of the design and production of BIM products with parametric library elements in BIM using the Allplan building design system as an example. He noted that Allplan, as a BIM platform, is an ideal basis for an object-oriented 3D model. For example, construction professionals can use a BIM model to develop thorough and accurate

tenders or detailed construction plans. In addition, its cloud-based capabilities, including BCF via Bimplus or BIMCollab, simplify problem solving, making it a comprehensive solution for construction professionals seeking efficiency, accuracy and quality.

Of course, talking about modern methods in construction, one cannot forget the topic of 3D technology. Today, not many Ukrainian universities of applied sciences can announce the active use of 3D technologies in the practical training of students, in contrast to the Kyiv National University of Construction and Architecture, where they not only exper-



iment with the formulation and creation of various forms, but also engage in the construction of the first buildings. **Yan Kormilitsyn**, a laboratory assistant at the KNUBA 3D printing laboratory and CEO of the start-up «3b» presented new directions for the development of small



architectural forms and low-rise buildings using printing technologies on a 3D printer of fixed formwork.

«If we look at current results, we will see that we have already reached the form we need and that's it and the base with which you can work further. At the initial stage, there were certain difficulties in communication, but now we have a prepared team of like-minded people. This kind of practice makes it possible to form a team even during student years, and the team will be able to work successfully in the construction market in future and, thanks to the already formed coherence; to be competitive even before graduation.» Added Yan Kormilitsyn.

Discussion Panel: Wartime Challenges

Instability of prices for raw materials, drop in production indicators, shortage of personnel are just a few barriers that the construction industry and manufacturers have to deal with today. In the final part of the business meeting, concrete and reinforced concrete market experts discussed what are the ways to solve problematic issues and what companies should focus on now.

In particular, Victoria Spivak (Kovalska Group) noted that there are indeed difficulties in Ukraine related to product certification. First of all, it is uncertainty. Namely, in the first years when the law was put into effect, the rules of the game on the market remained unclear for a long time, that is, who is responsible for what, who will carry out certification, which bodies are authorized, and so on. Now the situation has improved, although there are still many controversial issues. For example, many standards still do not have a translation, and the problem with laboratories has not been solved either. Moreover, even with a modern laboratory, when switching to European standards, companies are forced to purchase new equipment, because it has certain differences, and as we understand, these are large capital investments that not every manufacturer can afford.

Regarding the main trends, Ms. Victoria voiced several points:

- Currently, high-strength concrete, concrete with highly dispersed reinforcement and sulfate-resistant concrete are actively in demand. First of all, it is connected with the construction of protective structures for various purposes.
- In the segment of reinforced concrete, there is a demand for fortification protective structures and structural elements. In other words, there is a demand for the quick construction of buildings and objects instead of the destroyed ones.

- If we compare the demand for commercial concrete and reinforced concrete, then the latter has a better position in the market. For example, today the market for reinforced concrete has decreased 2 times, and for ready-mixed concrete — 5-7 times.

Unfortunately, problems in financing, state regulation, in terms of training people, etc. are added to the issues of standardization today. Oleg Borysov (Construction Union of Ukraine) confirmed the problems with human resources. For example, the percentage of reduction of employees at enterprises producing reinforced concrete structures in some regions is 50 per cent. In addition to this, many manufacturers also face problems with the sale of products. Especially in regions close to active hostilities. As a result, companies are forced to lay off workers due to a lack of orders. That is, currently Ukraine has a situation where it is necessary to preserve not only the personnel potential, but also the enterprises themselves.

Vladyslav Gots («DBK-Zhytlobud»), as a representative of the full-cycle company, confirmed the statements of the previous speakers and added that currently the personnel situation is far from being resolved and requires new approaches. It is also necessary to take a new look at the very process of restoring damaged housing, in particular panel houses, where industrial home construction combined with modern technologies can quickly and efficiently solve the issue of square meters.

Lyudmila Kripka emphasized the importance of planning at the state level the future pace of reconstruction and the necessary volumes of building materials. This will make it possible to create planned conditions that will allow domestic enterprises to gradually adjust production rates to meet the needs of the construction market. It is also important to support domestic product and promote it, because these are the taxes that pay the salaries of our military, and this is our security. And this is the main thing that is important today.

In addition, Serhii Denisyuk (Karmel PE) raised the issue of compliance of domestic products with European standards in the segment of equipment production. Using the example of his own enterprise, he noted that today Ukraine cannot satisfy the equipment manufacturer with all the necessary components for the equipment, which is aimed at sales abroad. Moreover, the issue of specialists is quite a problem. Yes, it is almost impossible to find a designer in Ukraine who would have the right to carry out work in accordance with a number of European standards with appropriate certificates. Unfortunately, we do not train such specialists.

But despite all these problems, the meeting participants agreed that Ukraine will endure, rebuild and flourish.



«Penetron Ukraine»: results of the year



When you touch the bottom with your feet, it's only up to you whether you sink or push yourself to the surface. On February 24, 2022, all of Ukraine felt the bottom with its feet: it seemed that this was the end, that only destruction, impoverishment and death would follow. Death has become synonymous with Life, life in Ukraine. At the time, it didn't occur to me how this could happen to us: a nation that NEVER started wars and had no territorial or cultural claims to anyone. How could they sneak into the warm dreams of our children in the middle of the night...

But we are Ukrainians, and Ukrainians do not know how to surrender to fate! We stood up to defend ourselves, our country, our future. The future that WE want for ourselves and our children. Millions went to fight on the battlefield, millions remained to fight in the back — to fight with the invisible assistants of death: fear, impoverishment, apathy!

And we did it! We resisted despair and frustration! Small and large businesses work, the economy of the state works.

Our company is no exception. On February 24, 2022, the earth was knocked out from under our feet twice: by the war itself and by the complete collapse of the business, which was based on cooperation with representatives of the neighboring world — the world of darkness, madness and death.

All of us, representatives of 20 offices, found ourselves at the same bottom: either we drown or push away. And we chose the second option. Just because a business has a past relationship with an aggressor does not automatically make it complicit in evil. No one could have thought that there, in

russia, such an obscurantism prevails. God knows, in 1991, the Americans did not think that such a thing could happen, when they were building a factory to supply products to the post-Soviet countries. That is why we decided to contact the Head Office in the USA with a proposal for cooperation between Ukraine and the USA and direct supply of products from the main factory in Allentown, Pennsylvania.

Despite all the problems of 2022, we were able to establish an uninterrupted supply of goods to the territory of Ukraine and entered 2023 in full readiness for Reconstruction.

Although the product is not new, we decided to completely update the evidence base of its effectiveness, all certificates and albums of technical solutions. We have signed contracts with leading scientific institutions of Ukraine — the National Scientific Research Institute for Building Constructions, National Institute for Infrastructure Development, the Marzeyev Institute of Public Health — for comprehensive research and analysis of the effectiveness of our products. Currently, we



have a number of protocols that confirm the absolute safety of our products for humans and the environment as a whole, as well as their high efficiency. In addition, together with the National Scientific Research Institute, we have developed ready-made technical solutions for all participants of the construction market, which will allow the correct and quick implementation of modern technologies in the construction process.

This approach allowed us to reach 70 per cent of the pre-war, but COVID19 time indicators for the main positions. We also launched several completely new products.

Our American partners are very surprised by the strength of the spirit of the Ukrainian people, because it is still not clear to them: how can you build when so called «gifts» are constantly launched from the sky? How can you invest with the risk of losing everything, and that in a second? It seems to them that they need to run somewhere far away and sit there quietly. It seems as if they are sometimes even afraid to ask how we are... But if everyone runs, who will rebuild Ukraine, who will build a future for our children?

Currently, the problems are not getting any less: logistical difficulties are added to the military operations. Queues at the border significantly increase the delivery time and its cost. But we keep the prices for the goods, and for special objects we offer the lowest prices. After all, rebuilding the state is not about money, it is about civic responsibility.

This vision is supported by the entire team of representatives of the Penetron brand in Ukraine and abroad. None of our dealers have left the country, all companies are working. Everyone is here to build our common future.

For this, we want to thank them all from the bottom of our hearts and wish them victory, fulfillment of dreams, achievement of new goals and success in all endeavors!

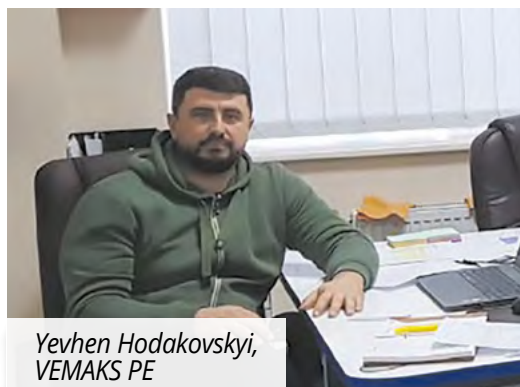
 *Olga Vorona,*
director of «Penetron Ukraine»



Penetron Ukraine Dealers:



Bohdan Shtokalo,
Concrete Saving Service Plus LLC



Yevhen Hodakovskiy,
VEMAKS PE



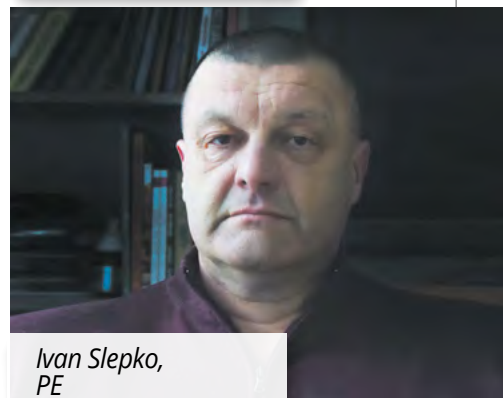
Oleksandr Ilchuk,
Big Kyiv LLC



Roman Strogyni,
Concrete Saving Service LLC



Maksym Hodakovskiy,
Waterproofing Service LLC



Ivan Slepko,
PE

Architecture of Safety: school shelters



During arrangement of shelters in schools, specialists face a number of challenges. In this article, we analyze regulations, statistics, and modern approaches to arranging shelters. Experts talk about the requirements for modern safety structures, and the Midgard school in Kyiv shares its experience of successfully renovating their shelter.

The educational process in Ukraine is currently organized in three forms: face-to-face, distance learning or their combination (mixed mode). One of the key elements of the safety of face-to-face education is proper arrangement of school shelters which should serve as protection in emergency situations.

The State Emergency Service of Ukraine was the first in 2022 to develop methodological recommendations for providing methodological assistance to local authorities in surveying and arranging the simplest shelters in educational institutions. According to the Ministry of Education and Science of Ukraine, as of the end of autumn 2023, only 79 per cent of education institutions could safely continue the educational process offline. A positive situation with shelter was recorded in 7 regions: Zakarpattia, Ivano-Frankivsk, Lviv, Ternopil, Sumy, Chernivtsi, Kyiv. In the regions closest to the frontline, the shelter situation is somewhat worse than the national average.

«According to the information provided by the local authorities, a total of 60,560 shelters have been registered in Ukraine. More than 50,000 of them are suitable for use which makes it possible to provide protection for approximately half of the country's population,» said Viktor Vitovetskyi, director of the Department of Civil Protection Activities of the State Emergency Service.

Here is a recall of the main requirements for shelters:

- it is advisable to place the shelter in the main building;
- shelters should be located in the underground room, on the basement floor of the educational institution;
- the general norm regarding the surface of the shelter is 0.6 m per person, the recommendation of the State Emergency Service: 1 square meter in the room for each child or teacher;
- the ceiling height should be at least 1.7 m;
- the shelter must have at least two evacuation exits;
- shelters cannot be placed next to large tanks that contain dangerous chemical, flammable, combustible and explosive substances;
- the shelter must be equipped with electricity, artificial lighting, water supply and sewage systems;
- the shelter must have forced or natural ventilation;
- external structures, load-bearing and external walls and ceilings of the building must be made of concrete, brick or other stone materials.

You can find out more about the recommendations on shelter arrangement on the website of the Ministry of Education and Science.



This year, the Ministry of Development of Communities, Territories and Infrastructure of Ukraine (Ministry of Reconstruction) approved building regulations and standards that establish requirements for the design of schools, kindergartens, hospitals, and housing. Starting from November 1, 2023, new building regulations for the construction of protective structures of civil defense

took effect (ДБН В.2.2-5:2023). The team of the Ministry of Reconstruction has developed a Practical guide for designing shelters in preschool and general secondary education institutions. The manual details the requirements for shelters. These include storage and anti-radiation shelters, as well as dual-purpose structures.

As reported by Natalya Pipa, secretary of the Committee of the Verkhovna Rada of Ukraine on Education, Science and Innovation, the construction, renovation and equipment of shelters remains the priority directions for the allocation of the education budget. In 2024, they plan to spend UAH 2.5 billion on this.

According to last year's audit of educational institutions, when considering types of shelters in educational institutions, the simplest shelters predominate (65 per cent), protective structures of civil protection make up 17 per cent, shelter facilities in dual-purpose structures — 13 per cent. In educational institutions, where it is not possible to arrange shelters in basements, it is planned to place shelter facilities on the school territory.

There are a number of factors that make impact to why not all the schools in Ukraine are equipped with shelters.

- Financing. Even equipping the existing shelter and putting it into operation, not to mention the construction of a new one, require significant investments. Sometimes shelter funding is delayed.
- Planning. Building and equipping a shelter requires significant planning, coordination and construction.
- Time. Repair or construction works can take a long time. For example, some schools started repairing the shelter only a few weeks before September 1, and some had to continue repairs even after the start of the school year.
- Standards for shelter. Shelters must meet certain standards regarding their location, equipment and safety.
- Conflict of interest. Sometimes there are conflicts of interest between safety needs and other needs of the community.

Renovation remains the most affordable way to quickly equip a shelter today. It has a number of advantages: saving resources, energy efficiency, social integration, environmental friendliness, economic growth and improving the image of the local community. One of the examples of successful renovation is demonstrated by the Midgard educational complex, which is located on the territory of the National Complex Expocenter of Ukraine (VDNG).

The main building of the school is located in the pavilion, which in previous years was dedicated to the construction achievements of the Soviet era. At the beginning of the building's lease, this abandoned space housed mock-ups of apartments that had previously been used by film studios as sets. According to the management, this monumental concrete structure is by itself relatively resistant to external influences and is able to withstand loads and vibrations. In the original project of the premises, a bomb shelter was provided, equipped with bathrooms and an additional exit. This functionality made it possible to quickly adapt it to the needs of a modern shelter. Renovations began immediately after the full-scale invasion began in 2022. Until then, the premises were used as a warehouse. The shelter has a total area of 600 square meters. To adapt this space to the needs of children in case of a long stay, a comprehensive renovation was carried out. In particular, the school installed a new modern ventilation system. Taking into account the experience of last year's blackouts, autonomous power was added to the centralized power supply using an industrial generator. The school also launched an autonomous solid-fuel boiler house, which provides heating for the entire building, including the shelter. This makes it possible to maintain a comfortable temperature in the room regardless of the external conditions. The comfortable furniture equipping the room was painted by the children themselves. In addition, the school has provided access to the Internet, which allows pupils to continue their studies online. The game room has recently been equipped with new PlayStations and large interactive panels. Such recreation areas help children to reduce their stress level during their stay in the shelter. The school management emphasized the importance of regular evacuation drills and replenishment of supplies.

Although setting up a shelter requires significant investment and planning, it is an investment that is well worth the effort. After all, these are measures to potentially reduce the risk for life and health of pupils in the educational process.

In addition to communities and schools, local authorities, construction companies and international organizations are involved in the construction and arrangement of shelters. Safety measures, such as school shelters, are important components of any educational security strategy. Schools and other educational institutions continue to work on improving their shelters. This will make it possible to ensure the safety of children and teaching staff, as well as to conduct face-to-face training where possible.



III Ukrainian Scientific and Practical Conference «The Role of Science in the Reconstruction of Ukraine»



On November 29, 2023, the State Enterprise «State Science and Research Institute of Building Structures» hosted the participants of the Third Ukrainian Scientific and Practical Conference «The Role of Science in the Reconstruction of Ukraine», which was dedicated to the celebration of the 80th anniversary of the Institute's founding. The Ministry of Infrastructure of Ukraine, State Enterprise «State Science and Research Institute of Building Structures», Kyiv National University of Construction and Architecture, Odesa State Academy of Construction and Architecture, Academy of Construction of Ukraine and the Building Chamber of Ukraine joined the organization of the event.

Specialists dealing with the development of construction science and the reconstruction of Ukraine, heads of non-governmental associations of builders of Ukraine, private entrepreneurs, state institutions, and representatives of local self-government bodies were invited to participate in the conference.

The Chairperson of the Committee of Verkhovna Rada of Ukraine on the Organization of State and Local Authorities, Regional Development and Urban Planning, Olena Shulyak addressed the participants of the conference with a welcome speech. She noted the successes of the SE State Science and Research Institute of Building Structures in integration into the European and global space and emphasized the role of the institution in solving the problems of restoration of buildings and structures damaged as a result of the aggression of the Russian Federation. In particular, over the past year, they carried out the work on the survey and development of restoration projects for more than 300 buildings, bridges, and other objects in Kyiv, Chernihiv, Bucha, Irpin, and other cities and villages.

The Deputy Minister of Development of Communities, Territories and Infrastructure of Ukraine Nataliya Kozlovska emphasized that the scientific contribution to the construction industry on behalf of the team of one of the powerful scientific construction institutes of the country not only formed the

outstanding history of the Institute, but also played a key role in ensuring the stability of our country's infrastructure. For example, among the significant construction objects in construction, preservation or research of which the institute participated, there are objects of cultural heritage (Sophia's Cathedral, St. Michael's Golden-Domed Monastery, Dormition Cathedral of the Kyiv-Pechersk Lavra, St. Andrew's Church, National Philharmonic), industrial and energy facilities (shelter over the fourth power unit of the Chornobyl Nuclear Power Plant, Dnipro Hydro Power Plant), public buildings (National Sports Complex «Olimpiysky», Kyiv and Odesa Opera Theaters, Stores «Children's World», «Artist's House», «House of Trade», Children's Hospital «Okhmatdyt»), large residential areas in Zaporizhzhia and Dnipro on subsidence soils, a significant number of residential, administrative, transport and other facilities.

Speaking to the participants of the conference, the President of the Building Chamber of Ukraine, Hero of Ukraine Petro Shilyuk spoke about the task of national construction science in the work to restore our cities destroyed and damaged by the Russian invaders. Thus, according to preliminary estimates, more than 200,000 infrastructural facilities need to be restored, the area of residential buildings put out of action is approaching 100 million square meters and taking into account that in the last pre-war years in Ukraine, 10-11 million square meters of housing were put into operation annually, there is an obvious need for a significant increase in construction.

Another pertinent question is determining the number and structure of affected housing and other objects in terms of regions, predicting sources of financing, strengthening the network of construction companies.

The President of Building Chamber expressed his belief that the Institute of Building Structures, created in 1943 at the height of World War II to restore the country from the destruction of the fascists, will today demonstrate high professionalism and extensive experience in rebuilding from the consequences of Russian aggression.



At the end of the speech, Petro Shylyuk congratulated the representatives of the institute on their anniversary and presented the team with the highest award of the Building Chamber of Ukraine — the Merit Order, and also awarded the institute employees with other Chamber awards.

The head of the State Agency for Reconstruction and Development of Infrastructure of Ukraine Mustafa-Masi Nayem, President of the Confederation of Builders of Ukraine Lev Partskhaladze, and First Vice-President of the Ukrainian Union of Industrialists and Entrepreneurs Serhii Prokhorov also congratulated the team.

The following issues were discussed at the conference:

- the current state and priorities of the development of construction science during the reconstruction and restoration of the country;
- regulatory and methodological provision of safety and restoration of damaged objects of civil, industrial, energy and hydraulic purposes;
- the role and potential of the national higher education institutions in reconstruction and restoration of the country;
- construction science and its influence on technical regulation in the conditions of reconstruction;
- scientific, technical, financial, and organizational problems of building materials industry development;
- science and business — prospects for development and interaction; specifics of international scientific and technical cooperation during the large-scale reconstruction of the regions of Ukraine;
- scientific aspects of energy efficiency and resource conservation in the conditions of modern construction;
- civil society impact on the construction industry.

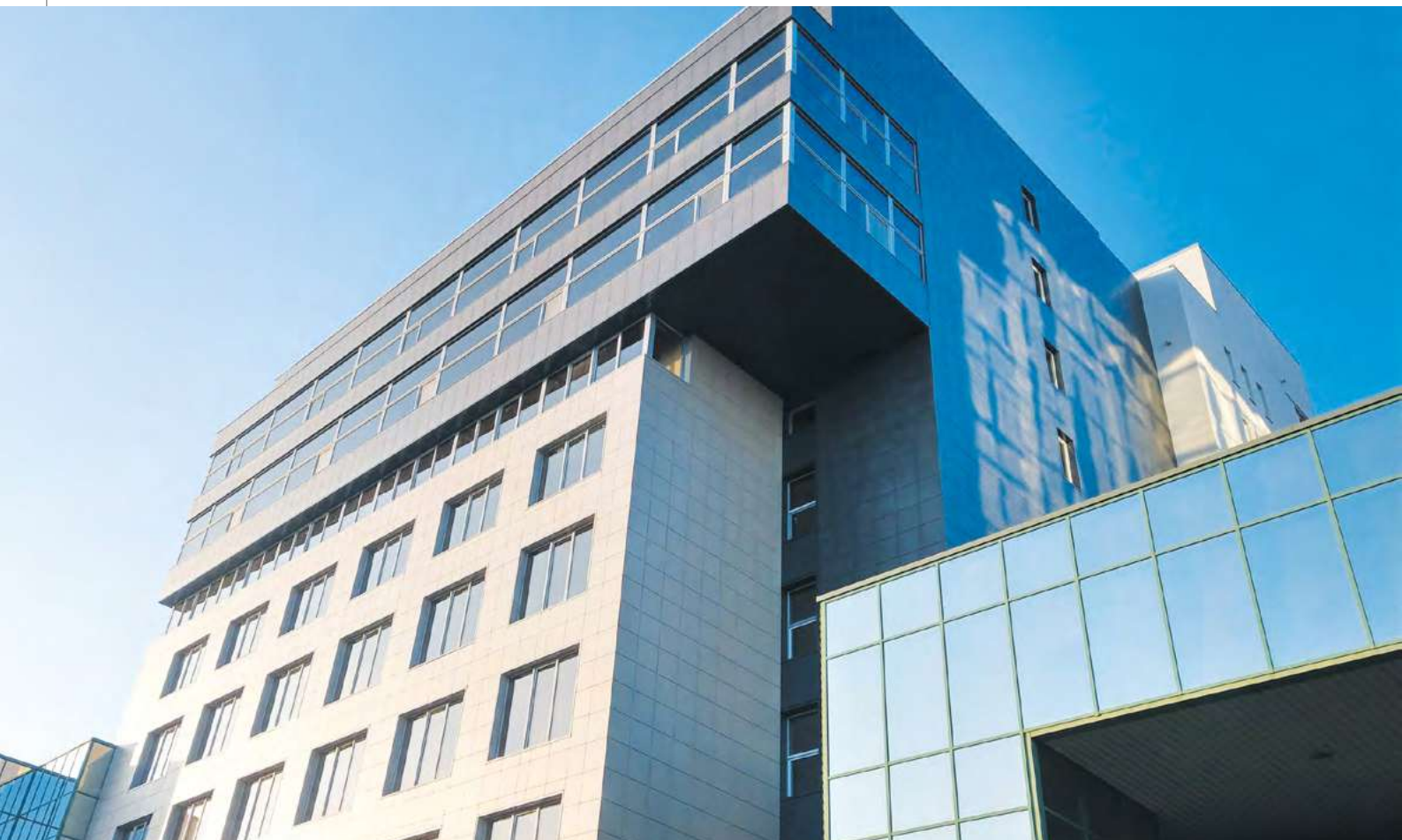
Leading scientists of educational institutions of construction profile — national ones (Odesa National Maritime University, Poltava Polytechnic University, Kyiv National University of Construction and Architecture) and foreign ones (Military Technological University and Institute of Construction Technologies from the Republic of Poland), the National Union of Architects of Ukraine, the Confederation of Builders of Ukraine, specialists of the Odesa City Council, scientists of the National Reserve «Sofia Kyivska», specialists of the Chernobyl Nuclear Power Plant, Khmelnytskyi Nuclear Power Plant, Public JSC «Ukrhydroproekt», heads of NGOs, volunteer communities, state institutions and business participated in the following interesting and meaningful panel discussions:

- Scientific and technical aspects of conducting surveys of damaged and destroyed residential and public buildings and infrastructure facilities.
- Specifics of examination, restoration and preservation of damaged and destroyed objects of cultural heritage.
- Current state of technical regulation and the specifics of the regulatory framework for inspections and design under martial law conditions.
- Ensuring energy efficiency of buildings in conditions of restoration and reconstruction.
- Science and business - perspectives of interaction.
- Modern technologies in energy, hydrotechnical and road construction.

The editors of ProfBuild magazine also joined the conference and acted as a media partner of the event. Svitlana Shah, editor-in-chief and founder of ProfBuild magazine, thanked the Institute team for their contribution to the introduction of new technologies to the national construction market, the development of Ukrainian science, as well as for their active work and participation in the reconstruction of Ukraine.



Curtain wall facades: market players' assessment



The external cladding of the building not only plays a significant role in the evaluation of the exterior of the building, but also performs an important function — protects it from the environment influence. A curtain wall facade (a curtain wall) copes with this task perfectly. Not only does it ensure an aesthetically attractive exterior of the building, but it also has a number of advantages in comparison to traditional cladding methods. What does the curtain walls market look like today and what are the top issues — our experts shared their views at an absentee round table discussion.

General picture

The curtain wall facade is a modern solution in the field of construction, which combines functionality, energy efficiency and aesthetic design. In Ukraine, curtain wall facades began to be widely used in 2006-2008. But the real «breakthrough» of technology occurred during the preparation for the UEFA Euro-2012.

Due to their advantages, curtain walls are used in objects of various purposes, in particular in commercial buildings (office buildings, shopping centers, hotels, etc.), residential buildings (high-rise residential buildings and private housing) and public buildings (museums, libraries, hospitals, kindergartens, schools and other public facilities). In addition, what significantly contributed to the popularization of the curtain wall technology, was the increase of energy saving programs for buildings and facilities, in implementation of which the use of curtain wall facades is one of the reconstruction solutions. This is a good way to change the design of the exterior of the building without interfering with the main structure. It is worth noting that curtain walls began to be especially widely used during the reconstruction of administrative and social buildings. Transition to European standards also contributes to significant market growth.

But despite everything, this market, like the others, depends on external and internal factors. For example, during the crisis caused by the coronavirus, along with the general decline in the indicators of the construction industry, there was a decrease in the share of all curtain walls in relation to wet facades due to the higher cost. At the same time, in large cities, the share of curtain wall facades is greater than in small ones.

Of course, there are differences in demand from the point of view of construction objects. For example, if we are talking about curtain walls, where the facing material is metal, then commercial real estate prevails here; if we talk about the market of stone products, the main share in high-rise construction is made of ceramic granite products. This is mainly housing construction and thermal modernization of public facilities. On the other hand, the main consumer of facade solutions made of glass is residential and commercial construction. These two categories consume the greater share of the volume, while social infrastructure has a minor share in the total volume of consumption of this segment.

If we talk about the components, almost all aluminum profiles for curtain walls are of Ukrainian production, 60% of galvanized metal is Turkish raw materials, but the production takes place at factories in Ukraine. Fastening is mostly imported and brought in by large suppliers.

The main customers are large developers. They have the greater share of orders. Also, not so long ago, another category of customers was formed — the private consumer. But in this case the curtain walls are rather used as decorative elements from the VIP cladding segment, in particular HPL panels. A developer usually works with cheaper materials. Although there are exceptions — everything depends on the category of the building.

If we look at the curtain wall facade market from the point of view of geography, then, undoubtedly, before the beginning of the full-scale invasion, curtain wall facades were actively used throughout Ukraine, although the use of more expensive technologies was observed in metropolises.

Market players' assessment

As always, for a deeper understanding of the situation, we collected assessments from curtain wall facade market participants who expressed their vision of the real situation and possible ways to solve existing problems.

Mykhailo Orlenko, Ukrainian Association of Windows, Doors and Facades, Executive Director:



— Taking into consideration a long war in Ukraine which directly affects all spheres of life and the economy of the country, the market of ventilated facades, in particular glass facades, is undergoing important transformations and trials. As of the second year of the conflict, we can see how the market is adapting to new conditions and challenges, despite significant difficulties.

The construction process, which is usually calculated for a 3-year cycle from the beginning of the design to putting a facility into operation, faced unprecedented obstacles due to the war. This led to the fact that many projects planned for 2022 were postponed or completely stopped. Such a situation will certainly affect the market of ventilated facades in the coming years.

Given the situation, it can be predicted that 2024 will be marked with the completion of construction projects started before the war. However, the main challenge and potential downturn in the facade market, especially in the glass segment, may come in 2025, given the delay in the start of new projects due to hostilities.

This projected decline highlights the importance of finding alternative strategies and investments in innovation that can help meet future challenges. It also indicates the need to support and stimulate the construction industry in order to minimize the negative consequences for the market and ensure its recovery after the stabilization of the situation in the country.

In the context of the shortage of raw materials for curtain wall glass facades, the situation in Ukraine remains tense, but under control. Despite the lack of own glass production in Ukraine and long discussions regarding the construction of a domestic glass factory, the market did not face a critical shortage of glass. This shows effective adaptation of suppliers and customers to the challenges faced by the industry.

Significant logistical difficulties, including problems with the blocking borders by Polish protesters, which temporarily hampered deliveries, forced many market players to look for



alternative delivery routes. A significant change in the supply chain was the increased use of railway transport, which allowed some suppliers to optimize the delivery process of glass and components for glass facades, ensuring the stability of supplies even in difficult conditions.

This flexibility is a key factor in helping the Ukrainian glass facade market remain viable and competitive despite the challenges posed by both global logistical disruptions and local challenges. Further strengthening of logistics strategies and expansion of supply channels is expected to help the market effectively respond to current and future challenges.

Regarding whether the composition of the main players and main customers has changed, the situation here is relatively stable with minor changes that have occurred since the beginning of 2022. One of the key differences was the withdrawal from the market of the Belarusian manufacturer of facade systems Alutech due to the political and economic



situation related to the war in Ukraine. This change reflects the impact of geopolitical events on business relationships and market structure.

In addition, there is a clear trend of redistribution of financial and human resources in favor of Western Ukraine. This is a consequence of military operations in the East and South of the country, which prompts companies and customers to look for safer regions for the implementation of their projects. Such a geographical reorientation can have long-term consequences for the development of the market of glass facades in Ukraine and emphasize the need to adapt to new economic and social realities.

These changes also affect regional demand, strengthening the potential of the western regions of Ukraine as a new center of construction activity and investment. This trend is expected to continue to shape market dynamics in the coming years, requiring market participants to be flexible and innovative in doing business in a changing environment.

Unfortunately, the main problem areas in the market of glass facades in Ukraine today derive from the lasting military conflict. The war makes significant adjustments to the construction industry activities, causing project delays, increased costs, and reorientation of resources to urgent needs.

The first and perhaps the biggest challenge is the preservation and restoration of infrastructure in areas that suffered from war. The need for rapid recovery not only drives the demand for glass facades as one of the solutions for rapid recovery of buildings, but also requires innovative approaches to their design and installation to minimize recovery time.

Logistics problems, exacerbated by recurrent border closures and damage to transport infrastructure, require companies to be flexible in planning supplies and finding alternative ways to deliver materials, including switching to railway transport.

Lack of funding and investment also becomes a significant problem, as a large part of the country's resources are directed to military needs and humanitarian aid.

Ways to solve these problems cover a wide range of measures — from state support to the industry to intensifying work with international partners to attract investments and humanitarian aid. An important aspect is also the use of innovative technologies to optimize production processes, increase construction



efficiency and reduce costs. It remains a key task to involve all interested parties in cooperation: the state, business and the international community to solve urgent problems and support the recovery of Ukraine.

Oleksiy Shytko, Owner and Director of the Sphere-Facade company:



— The curtain wall facade market has really transformed a bit. First of all, compared to a few years ago, more and more people want to get curtain ventilated facades. That means there is already enough information in society, facing material is actively spreading, there is more interest in it, but it is not always possible to purchase it.

Regarding preferences for cladding materials, many people prefer natural materials (wood, stone), but there is one catch: to

ensure durability, they need constant reworking. And the question arises: are people ready to process these materials after some time, or is it better to use an artificial material? However, in general the trend is moving towards eco-friendliness and sustainability.

Earlier the most popular cladding material was aluminum composite panels. Today, people are trying to move away from such panels and want something new and interesting. I must say that this need is fully satisfied by the curtain wall market. Now you can fulfill any whim — the market is over-stuffed with various materials. But still, there are projects that cannot be implemented without the use of the aluminum-composite panels.

It is worth noting that glass facades are gaining popularity. Moreover, recently they have become more economically reasonable, which further strengthens their presence on the facade market.

Of course, along with changes in the market there are always problems. One of the important ones is insufficient design quality. Yes, quite often very beautiful pictures are drawn in the project, and then the question arises: how to install it all. Of course, there are quite high-quality projects, but usually most of them need to be refined, because many aspects are overlooked during the design process.

But even if you have a well-designed project, a quality system has been selected, without qualified installation, all this loses its value. After all, in order for the curtain wall facade to withstand the stated operating periods and perform the stated functions — qualified installers, technical supervision, and all other aspects are needed. Now, unfortunately, with a labor shortage in all industries, plus a full-scale invasion, and many people on the frontline, the scheme that used to exist to hire people and train them quickly, and then on-the-job training with technical supervision — it no longer works. Because there are not enough people who have remained and have the necessary level to perform the required work.

For ourselves, we see such a solution to the problem of personnel: creation of training centers where those who want to will study the theoretical part in express mode (in a month and a half) and acquire basic practical skills in order to have at least a foundation. Then the skill will be improved already at the facility. We used to hire an almost ready specialist and prepared him in a week or two, now the situation with specialists is dramatically difficult.



Of course, it is not enough to simply teach a person — you need to support them with loyalty, salary, normal attitude: legitimate vacations, help for the family with housing, etc. It is also necessary to help with constant learning and improving, as well as to provide a sense of stability with the help of stable work.

As for the facade market itself, today the construction market is recovering, conversations are already more lively, more specific. We can already say that it is possible to work. Yes, the attacks are still ongoing but less, and this had a positive effect on the construction market, a certain stability appeared. For example, if we talk about ventilated facades, with the beginning of a full-scale invasion, the lack of some components became noticeable, but today there is no more shortage.

The only thing that is disappointing is the Polish border — today it takes longer than it used to be. And the delivery of materials from India also became longer. This is because they are transshipped in Romania or Poland and transported by car to Ukraine due to the lack of direct supply, as, for example, previously through the Odesa port. Therefore, now the problem is exactly in terms of delivery. We ourselves started looking for different factories, manufacturers in Ukraine or Europe, however we are more focused on domestic manufacturers. Especially since there are many to choose from. For example, if earlier there were several brands of aluminum-composite panels on this market, now there are more than thirty of them.

Nowadays, everyone tries to make projects unique, so that they are architecturally expressive and interesting, but almost every object needs to be discussed in detail, and for this you need specialists. As you can see, we are once again facing the personnel problem.

Regarding the priority when choosing the facade components, it is quality, price, wide format, ratio with the pattern, burn out, dusting, and then — service life, etc. Precisely taking into account the above mentioned, porcelain stoneware is gaining more and more popularity.

We have experience in the renovation of public property but unfortunately, in this case they do not always make the most optimal decisions regarding the cladding material. Quite often, the design is being simplified. Few people want to do an expertise in order to implement a more in-depth project. For example, the marmoroc system has a service life of more than 50 years but there are many colors, and the ventilated facade works correctly and performs its immediate functions, but few people take this into account. Also, designers, when considering the design of a multi-story building, pay very little attention to laying the necessary air layer for effective circulation, etc.

As you can see, even from the facts listed above, it can be concluded that the curtain wall facade market in Ukraine still has a number of problems, but we are moving in step with world trends, and I believe that very soon active construction will begin in the country, where curtain wall facades will take their place among the most popular technologies.



It is important to develop our own product in order to have a strong and independent state



Valery Kotlyar, founder and director of the Barks company, spoke about the trends and problem areas in the market of curtain wall facades, as well as about the prospects for recovery.

Background: the Barks company was founded by specialists who have more than 10 years of experience in the field of curtain wall and curtain wall glass facades to meet the needs of the client in a technological Ukrainian manufacturer which could provide the market with a product that is no worse than the one produced by the European manufacturers.

The key area of the company's activity is development and production of Ukrainian energy-efficient aluminum solutions for construction, namely: curtain wall facades, glass curtain walls, glass partitions, sun protection lamella systems, ventilation grilles.

— Today the market is going through not the best times for obvious reasons. Of course, there is a number of problems that the market had before the full-scale invasion, such as a lack of human resources. But now this situation has become even more complicated. After all, most of the jobs related to the production and installation of curtain wall facades are purely male dominated. In particular, in terms of installation, very few people know how to install a ventilated facade correctly. This experience is acquired through many years of practice. Unfortunately, often those people who have such experience either do not want to pass on knowledge or do not know how to do it.

Moreover, the problem of personnel concerns all levels: from workers to designers and accountants. Sometimes there are even situations when architects want a certain cladding, but there is no one to implement such a decision. Today, in Ukraine, there is no opportunity to obtain a profession that allows you to perform work on the installation of curtain wall facades or their production. No educational institution offers such services, so companies must independently solve the issue of personnel training. One option is for manufacturing companies to take on the function of training for their production and installation.

It is also worth paying attention to mistakes from the customer's part, which often happen. The main one is the pursuit of cheapness. We still have the principle of «I want quality but make it cheap.» Many people also do not fully understand at the initial stage of construction what exactly they want from the object under construction. This leads to an incorrect calculation of the load on the enclosing structures, which subsequently affects energy efficiency, duration of operation, comfort, and other indicators. Therefore, it is important to explain all this and develop projects taking into account all the advantages during the life cycle of the building.

Usually, manufacturers of curtain wall facade systems have catalogs of already developed solutions that contain basic calculations. This allows you to quickly calculate the project and put the order into operation. These are not all solutions, but only the main ones. By the way, the availability of such catalogs is one of the proves that the company has experience and knowledge in this field. In addition, in order to compete on the market, the contractor must have the experience of work on large objects, the correct organization of work, which contributes to saving time and resources. It is also important to have one's own production facilities, since in-house processing of both facing materials and structures plays a huge role in facade structures. This allows you to be prompt and ensure quality control. Plus, the contractor must have his own design team. But all this, of course, is relevant only when the company has experienced teams that are narrowly specialized in their work. Of course, this is an ideal model for such business, but this approach really does guarantee quality.

By the way, today the customer increasingly takes into account the competence of the company at the level of consultation. It is very important not to impose your vision on the project but to warn the customer about possible risks of the proposed solutions.

Another «pain» of the market — the market of facades, like many others, suffers from unprofessional companies. On the one hand, this is price dumping on the market, and on the other hand, it undermines the reputation of all facade solutions. Low-quality works, without compliance with technologies, using materials whose quality is in question, harms the entire market.

As for the main ways of finding customers, then, traditionally, word of mouth takes first place. Personal achievements are always key, so the reputation of the company has the most weight.

Turning to the issue of market segmentation of curtain wall facades in relation to facing materials, it is worth noting

that in Ukraine the choice is quite large. As they say — for any budget. As for their availability, everything is more or less stable here, too. Even taking into account the fact that curtain wall facades (or facade systems) are mainly structures using an aluminum profile, which is made 100 per cent of imported raw materials, the situation is under control.

As for preferences, the curtain wall market also has its own trends. For example, if earlier aluminum cassettes and metal cassettes were quite popular, now they have lost their leadership a little. Although their popularity used to be fully justified. Currently, ceramic granite is used increasingly. Of course, there are orders for fiber-cement panels, HPL panels, aluminum composite panels, granite, clinker, ceramic panels, and many other finishing materials. But it is ceramic granite that currently makes up a significant share of the curtain wall facade market. First, we have our own clay. And if earlier the main problem was that manufacturers did not have equipment for large-format plates, now this problem has been solved. The situation was also affected by the fact that in 2019, there was a crisis in the container transportation market, and accordingly the freight rate increased, which means the cost price of the metal. This had a positive effect on the increase in the share of ceramic granite curtain walls. Secondly, it is non-flammable, which is also a significant advantage. Although ceramic has its drawbacks (for example, it cannot be perforated), it continues to conquer the market.

Glass facades are a separate group. They also have their fans. Moreover, the amount of glass in architecture is constantly increasing, even in spite of the realities in which we live today. In part, this is a global trend; on the other hand, the design process is quite long, so for some of today's facilities that are at the final stages the solutions were calculated before the start of a full-scale invasion. Plus, no one plans to live in the conditions that currently exist in Ukraine. Everyone believes in victory and a return to normal peaceful life. It should also not be forgotten that energy efficiency, external attractiveness and practicality are important indicators nowadays. Unfortunately, Ukraine does not produce glass for facades, but this does not prevent us from manufacturing systems with glass as a facing material.

In contrast to glass, HPL panels are losing their popularity, although they have proven themselves well in decor due to their natural wood-like look and a large format. But its cost and flammability class are inferior to ceramic granite. For example, ceramics have a flammability index 'non-flammable', while HPL panels have a flammability index of 'flammable 1'.

Of course, talking about the curtain wall facade market, one cannot ignore the issue of insulation. Here, there is only a minor dependence on imports. If we talk about the tastes, then we can say that in Ukraine the market is more practical. There are only a few orders from the category of complicated art constructions.

It is also worth noting that the list of objects where curtain wall facades are actively used has also changed. If earlier the main customers of curtain wall facades were commercial real estate objects, now it is quite natural to see this technology in residential high-rise buildings, social infrastructure objects and private houses. One of the reasons is a change in building regulations, higher requirements for energy efficiency, etc. At the same time, curtain walls are actively used both during new construction and renovation. However, unfortunately, there are often two approaches in decision-making: some want to make only a good picture,





and then the characteristics of the system are not taken into account, the main thing is that the facade is beautiful. Accordingly, preference is given to a cheaper material, regardless of durability. Another approach is the selection of materials taking into account their service life. Here, I want to point out that high-quality ventilated facades, for example, made by the BarkS company, have a guarantee of up to 50 years.

Regarding price fluctuations, of course, they are present on the facades market. For example, if we take such a component as aluminum, then in 2022 its value increased by 40 per cent compared to 2021, because not all the plants were working. But then the prices began reinstating. If we compare the cost of the raw material component today with the indicators of 2021, it has not increased significantly (in the range of 10-20 per cent), but the estimates for labor costs have increased significantly.

I would also like to talk a little about common myths about the disadvantages of curtain wall facades. The first of them is that the panels are too heavy.

This myth is true when heavy materials are used, such as ceramics or natural stone tiles. Instead, HPL panels or aluminum composite panels are very light. Mainly during the renovation of residential buildings, light weight fiber-cement panels are used, the price of which is quite acceptable compared to the cost of cladding from stone or ceramic mass.

The next myth is that the thermal insulation layer under the curtain wall facade shrinks! But cotton wool will not shrink if the work is carried out in accordance with the technology of work and taking into account the recommendations of manufacturers. The most com-

mon reason why cotton wool shrinks is that cotton wool is chosen incorrectly in order to save money during work that is not visible at the first glance.

How to choose a filler for a thermal insulation layer correctly? Please note: cotton wool manufacturers clearly indicate which types of cotton wool can be used for ventilated facades.

Another myth is that the thermal insulation layer under the curtain wall facade gets wet. But in such a facade, thanks to its natural ventilation, moisture evaporates much faster from the insulating material and does not accumulate. It is removed by drafts. It is important that the insulation material and the wind protection film that protects it are properly fixed so that there is an appropriate ventilation gap. At the same time, water can get into the thermal insulation layer in two ways: when rainwater under the influence of wind and capillary forces penetrates through the seam between the panels; when the so-called dew point is formed, which moves inside the heat-insulating layer, thus increasing its humidity. However, thanks to the ventilated air gap, moisture is quickly removed and does not accumulate.

Of course, no one is surprised by the constant comparison of the advantages of wet and ventilated facades, among which the main argument is that wet facade is cheaper. Thus, the initial installation of plaster (wet) facades, in which polystyrene foam is used, costs less. On the other hand, if you look at the long-term perspective, you should evaluate the expected operational costs — painting the facade, repairs, possible mold.

According to a study conducted by the Agency for Energy Saving in the Residential Sector, the rates for contract work provided for in the investment plan are approximately 20 per cent lower than the estimated average market value, and the rates for wall insulation between plastered and ventilated facades differ by approximately 30 per cent.

If we compare wet and ventilated facades in the long term, it becomes clear that the slightly more expensive ventilated facades at the beginning pay off faster, because they do not require as much attention and care as wet facades.

In conclusion, let's talk about prospects. Of course, today it is quite a difficult task, because we cannot say what the situation in the country will be tomorrow, but no matter how difficult it is, we all believe in our victory. Therefore, we hope that the reconstruction of Ukraine, about which everyone talks so much, will begin in the nearest future. And curtain wall facades will make up a significant share in facade cladding of both new and renovated buildings.



EDUCATIONAL SEMINAR ON CURTAIN WALL FACADES FROM BARKS



Today, every business in Ukraine has a common problem — a lack of human resources. The market of curtain wall facades is no exception, and here there is also a gap in vocational training of specialists capable of performing the curtain wall facades installation or their production. As part of cooperation between the Construction union of Ukraine, the Barks company and the ProfBuild magazine, on March 18, a training seminar on curtain wall facades was held at the Chernivtsi Professional Construction Lyceum — PROFVENTFASAD by BARKS.

Unfortunately, no educational institution in the country offers appropriate educational programs or courses for training specialists to work with curtain wall facades or their production. This problem requires an immediate solution, as both the quality of work and the overall progress of the construction industry suffer due to the lack of specialized training. One of the possible options for solving this issue is that production companies can take the initiative to teach how to work with their products. It can be organization of specialized courses, internships or practical classes for future specialists. However, the most optimal solution is the joint activity involving trade unions, educational institutions and companies to create specialized educational programs and courses. A vivid example of such symbiosis was a training seminar at the Chernivtsi Professional Construction Lyceum, which was conducted by the Barks company with the assistance of the Construction Union of Ukraine and Prof-Build magazine.

The professional audience, which gathered in the walls of the construction lyceum, was able not only to get use-

ful information about the technology of curtain wall facades, but also to discuss the relevance of certain solutions that are currently used in installation of facades. In particular, among the invited guests were teachers and masters of industrial training of the Chernivtsi Professional Construction Lyceum, Higher Vocational School of Zastavna, Chernivtsi Region, Higher Professional Art School No. 5, Chernivtsi Polytechnic Vocational College, Chernivtsi College of the Lviv National Agrarian University, representatives of the Department of Education and Science of the Chernivtsi Regional Military Administration and the Educational and Methodological Center of Vocational and Technical Education in the Chernivtsi Region, as well as managers and foremen of the construction companies Chernivtsizhytlobud, Delta, Vodogray, and the Bolena Window Factory company.

Of course, such meetings do not ensure complete immersion in the topic but provide an understanding of the main points. Valery Kotlyar, founder and director of the Barks company, gave a general overview during his speech and talked about the advantages of using curtain wall facades, types and elements of frames for curtain walls and their differences, insulation elements and facing materials for curtain walls and their features, techniques for processing facing materials, etc. Lively discussions and debates that accompanied the entire event proved that this approach to solving the personnel problem has a chance of success. This format provides an opportunity to exchange practical experience between manufacturers and suppliers of hinged ventilated facades, builders, teachers and masters of industrial training. So, it is worth not stopping, moving forward, because in the absence of professional training of specialists, the construction industry requires attention and urgent measures to ensure sustainable growth and development of Ukraine. Join in!

We would like to thank the Chernivtsi Professional Construction Lyceum for the hospitality and active participation in the organization of the seminar.





SOLAR ENERGY SECTOR OF UKRAINE: CURRENT STATE AND NEW CHALLENGES

foto: freepik.com

Solar energy is a relatively new branch of the electricity sector of Ukraine, but it has quite high chances for active development. After all, according to experts, more than 80% of the territory of Ukraine is suitable for the development of the solar power plants system. Market participants spoke about the current state of Ukrainian solar energy, key challenges and risks, as well as the industry's prospects.

— Starting from February 24, 2022, Ukrainian energy facilities are under constant attack by the Russian military. The power system withstood hundreds of such attacks and even survived the first blackout in its history. In general, more than half of Ukraine's energy infrastructure was damaged. According to a joint assessment of the United Nations Development Program (UNDP) and the World Bank,

the damage caused to the energy infrastructure of Ukraine last year already exceeded \$10 billion. As of April 2024, the situation has worsened significantly. Solar energy is part of the unified energy system of Ukraine, so the current situation must be considered comprehensively.

At least 13 per cent of industrial solar power plants were destroyed or damaged. Also, more than 950 MW of the installed capacity of solar power plants ended up in the occupied territories. These are 62 industrial solar power plants, not including small ones, up to 30 kW home solar power plants. About 5,900 MW of industrial solar power plants and more than 1,200 MW of domestic small solar power plants are located on the free territory of Ukraine, which also suffered significant losses as a result of hostilities.

By the beginning of 2022, there were approximately 45,000 prosumers. The idea of prosumer energy is for each household to generate its own energy, thereby becoming independent of the electricity supply. At the same time, surpluses produced by prosumers are fed back into the grid so that

General condition and prospects

Effective functioning of the economy is impossible without stable operation of the energy industry. Before the start of full-scale aggression, the Ukrainian energy industry was one of the largest in Europe. The installed capacity of power plants included in the unified energy system of Ukraine in February 2022 was approximately 37 GW. What is the current state of solar energy in Ukraine, are there prospects for «green» energy now, how is it possible to get out of the crisis and how can the Solar Energy Association contribute to this? These and other questions were answered by **Vladyslav Sokolovskyi**, chairman of the board of the Association of Solar Energy of Ukraine:



consumers can use electricity at times of increased demand. Currently, according to our Association's estimates, the number of prosumers has increased by approximately 9,000 and has exceeded 54,000.

During 2022, 220 mW of solar power plant capacity was put into operation, of which 22 facilities are up to 1 mW and 206 mW of household solar power plants. In 2023, according to incomplete data, 115 MW of solar power plants was built. Last year, many new solar power plants were equipped with energy storage systems. However, it is currently difficult to estimate the total and corresponding energy storage capacity installed at a specific power plant.

Accumulation of receivables on the electricity market has become a serious problem for the entire energy sector of Ukraine. The solar energy sector is seriously affected by the debt of the state enterprise «Guaranteed Buyer» to industrial producers of renewable energy at the green tariff. This is caused by military actions, the use of non-market mechanisms for the formation of electricity prices for the population, a decrease in the solvency of consumers and delays in calculations. The level of payment of the state enterprise for 2022 was 55.5 per cent of that stipulated by Ukrainian legislation. In 2023, the volume of settlements increased to 77.3 per cent.

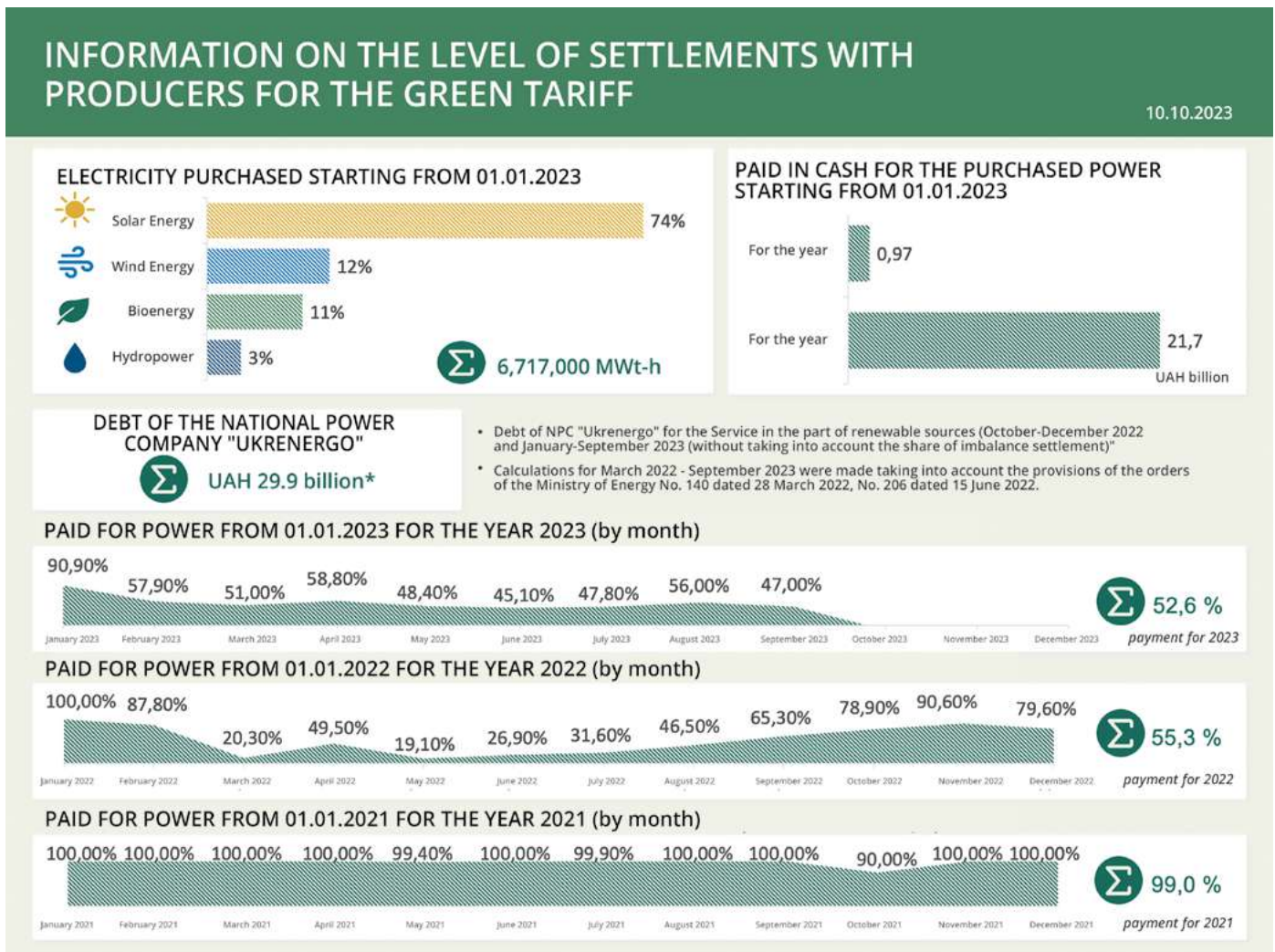
At the end of September 2023, the total debt of the company «Guaranteed Buyer» to producers of renewable energy exceeded UAH 35 billion. However, at the beginning of this

year, the situation improved, and debts decreased to the level of UAH 23 billion. The possibility of development is worsened by the complicated, formalized procedure for connecting to power grids and increasing the capacity of power plants. Also, the problems are aggravated by the existing damage to the equipment caused by military actions. This, in turn, reduces the amount of electricity produced by solar power plants and leads to an increase in debt to domestic and foreign investors who have invested in the development of renewable energy.

The «Energy Strategy of Ukraine» envisages the installation of 94 GW of solar power plants by 2050. The Institute of Renewable Energy of the National Academy of Sciences of Ukraine estimates the total capacity potential of all renewable energy sources in Ukraine at approximately 874 GW.

Nearest goals:

- Development of distributed generation based on including green generation. This should ensure stability, reliability and, in the future, environmental friendliness of the Ukrainian energy industry.
- Full integration of Ukrainian energy into the EU energy system.
- Implementation of guarantees of origin of electric energy produced from renewable energy sources. This is a powerful tool for the development of green energy and the economy of Ukraine in general. The recognition of Ukrainian guarantees of origin in EU countries



Writing under the data Source: SE «Guaranteed Buyer»



is extremely important. In the case of the final implementation of this mechanism, products produced in Ukraine and exported to the EU will not be additionally taxed with a carbon tax on the territory of the European Union

What will help achieving these goals is:

- Full transition to market mechanisms of electricity price formation in all market segments.
- Synchronization of Ukrainian legislation in the field of energy with relevant EU regulations.
- Implementation by the State Regulator (NKREKP) of more effective incentives for operators of the distribution system (former Oblenergo) aiming to increase the interest of the latter to expand the opportunities for connecting solar power plants to power grids.
- Reducing the monopoly of distribution system operators.
- Liberation of the occupied territories. Implementation of the financial compensation mechanism for damages and insurance of solar power plants against damage during hostilities.

The Solar Energy Association of Ukraine constantly monitors the current situation in the energy industry and is involved in most important processes in the renewable energy sector. The union is the largest non-profit public organization of solar market participants in Ukraine. We represent the interests of industrial solar plants; Ukrainian and foreign investors; companies that carry out design, construction and maintenance of solar power plants; manufacturers and importers

of equipment for solar stations and owners of domestic power plants. Our community has more than 7,000 people.

Our public organization responds to complex challenges, primarily caused by military actions. It is about legal and expert assistance to damaged solar power plants, development of a further program of actions for the “treatment of diseases” of the industry, preparation of conditions for sustainable development. The union cannot leave its members without support.

Solar energy, like the entire country, is under considerable pressure due to military aggression. However, thanks to internal reserves, European integration processes and international support, Ukrainian solar energy will be able to reveal its full potential. Ukraine’s energy system can withstand the turbulence of war and should become “anti-fragile”.

Assessment from market players

Despite the huge losses, damaged generation facilities and the outflow of personnel in the industry, most Ukrainian companies are trying to do everything possible to restore their business, save jobs and pay taxes on time. In addition to the industry association’s assessment, we interviewed market players to better understand the real state of the industry and their thoughts on the outlook.



Viktor Kondratyuk, “Ecotechnik Ukraine”:

— Despite active military operations in Ukraine, solar energy is actively developing. The main directions of development are solar stations for personal needs at enterprises, shopping centers, schools, and hospitals. In particular, a lot of solar stations are installed in retail chains and gas stations, where the main consumption occurs during the daylight hours.

Installation of solar stations allows you to save money on electricity. The average payback of the projects is about 3 years, and in the future the company uses its own electricity and becomes less dependent on electricity suppliers. In addition, the installation of autonomous systems makes it possible to work in case of emergency power outages.

One of the main risks holding back the development of solar energy is our inadequate “neighbor” who started a war. Many businesses are ready to install solar stations, but cannot do so due to the risks of losses after to missile attacks or drone attacks. In the southern and eastern regions, which are close to the front line, the development of solar energy has practically stopped. And even in the central regions there are risks of destruction and damage to equipment. For the same reason, foreign investors are not ready to invest in the solar energy sector of Ukraine, which also inhibits its development.

In my opinion, at this stage, as long as the war continues, solar energy will be more developed in the western and central regions of Ukraine, where the risks are much lower. But after the victory of Ukraine, solar energy will be actively developed throughout the country. I believe that during the reconstruction of Ukraine, energy-saving technologies and solar power plants will be installed in every project. Autonomous solar systems will be installed, which will enable enterprises and organizations to be energy independent. Installation

of solar stations on the roofs of schools, hospitals and other public institutions is also a promising direction.

Ukraine has the opportunity to become a leader in Europe in the use of alternative sources of electricity.



Irena Brik,
ISO Company:

— According to the forecasts of European experts, solar energy in Europe in 2024 for the first time will be the leader in the growth of electricity production in the entire energy sector. Can Ukraine boast of such indicators? Not yet. In principle, we have a mega-complicated situation with energy, and we all see and understand it. In order to understand how to characterize the general state of solar energy in

Ukraine, we must first agree on what we are starting from and what we compare the indicators with.

Considering the fact that we have an undeclared war, I believe that everything is much better with solar energy than it could be in this situation: green energy is definitely developing dynamically.

Take away electricity from a person, and they automatically become primitive — it is hard to argue with this or to add anything. It is blackouts and energy instability that motivate Ukrainians to look for alternative ways to live more or less comfortably, and the sun is one of the first helpers here — solar power plants have demonstrated their effectiveness and created an important energy balance in the overall energy system in these difficult times.

Ukraine took a course towards the EU and automatically brings the general legislation and the one on alternative energy in particular — closer to its norms. Finally, although not everywhere, a currently working law on NetBilling has appeared — a mechanism long awaited by businesses suffering from electricity tariffs. It is solar power plants that is an ideal helper and remedy for enterprises in this situation, because the payback of solar systems has decreased by three times — from 6-8 years to 1.5-2.5 years. The changes envisaged by the law will allow households and businesses to dispose of the electricity they produce.

Today, solar energy is actively being loaned by banks, there are many grant programs from various funds and foundations, and they are actively implementing a solar alternative at critical infrastructure facilities — in hospitals, dispensaries, etc. There is already the first market participant with a license for energy storage, and this is only the beginning of the history of Storage Systems, which is so necessary in Ukraine today. There are many important projects ahead — for example, PJSC “Ukrhydroenergo” has planned to install storage systems with a volume of 212 MW and solar plants with a capacity of 63.9 MW as an additional source to meet the needs of hydro-power plants.

As of today, the installed capacity of renewable sources in the country has exceeded the mark of 10 GW, and solar power plants alone could provide about 500 MW of energy capacity in the last year.

We live in a country that is attacked every day by enemy missiles, targeting the energy sector the most. So, I think it makes no sense to announce the number one risk. If you look at the current situation in general and globally, it is not only Ukraine that is developing rapidly in this niche. Currently,

solar energy is a global trend, and interest and appetites for “the sun” are growing more and more every day. We can often observe a shortage of equipment, which is rather difficult to get to Ukraine today, and we won't have local production for long time. In addition, China is the main leader in the production of SES equipment, and some of the top Chinese companies are subject to sanctions, which narrows the possibilities of obtaining the necessary products in principle.

In addition, not everything is fine with the legislation of Ukraine yet — it is just beginning its path to adaptation to international standards, and the transformation of the green energy market is still ahead.

In fact, both the product and the customer have changed significantly compared to the period before the full-scale invasion. So, I believe that if we do not take into account those situations where there was a lot of loss for the solar stations, today we are doing relatively well with solar energy, and the prospects of being one of the greenest countries in Europe are very real. There is no doubt that we have at once interesting and turbulent times ahead.



Oleksiy Kolesnikov,
IQ Solar:

— Solar energy in Ukraine has experienced significant growth in recent years. The country has great potential in this sector due to favorable climate conditions and relatively low installation costs of solar power plants. The implementation of various renewable energy support programs also stimulated the development of this industry.

Today, one of the main challenges is the instability of legislation and regulatory conditions, which can cause uncertainty for investors. Also, changes in energy prices and instability in energy policy can affect the profitability of solar projects. Important factors are infrastructural limitations, in particular technical ones, as well as insufficient development of the network.

As for the prospects of solar energy in Ukraine, they are great. With the right development strategies, state support and technological advancement, the solar energy sector can become an important component of Ukraine's energy system, contributing to its economic growth and stability.

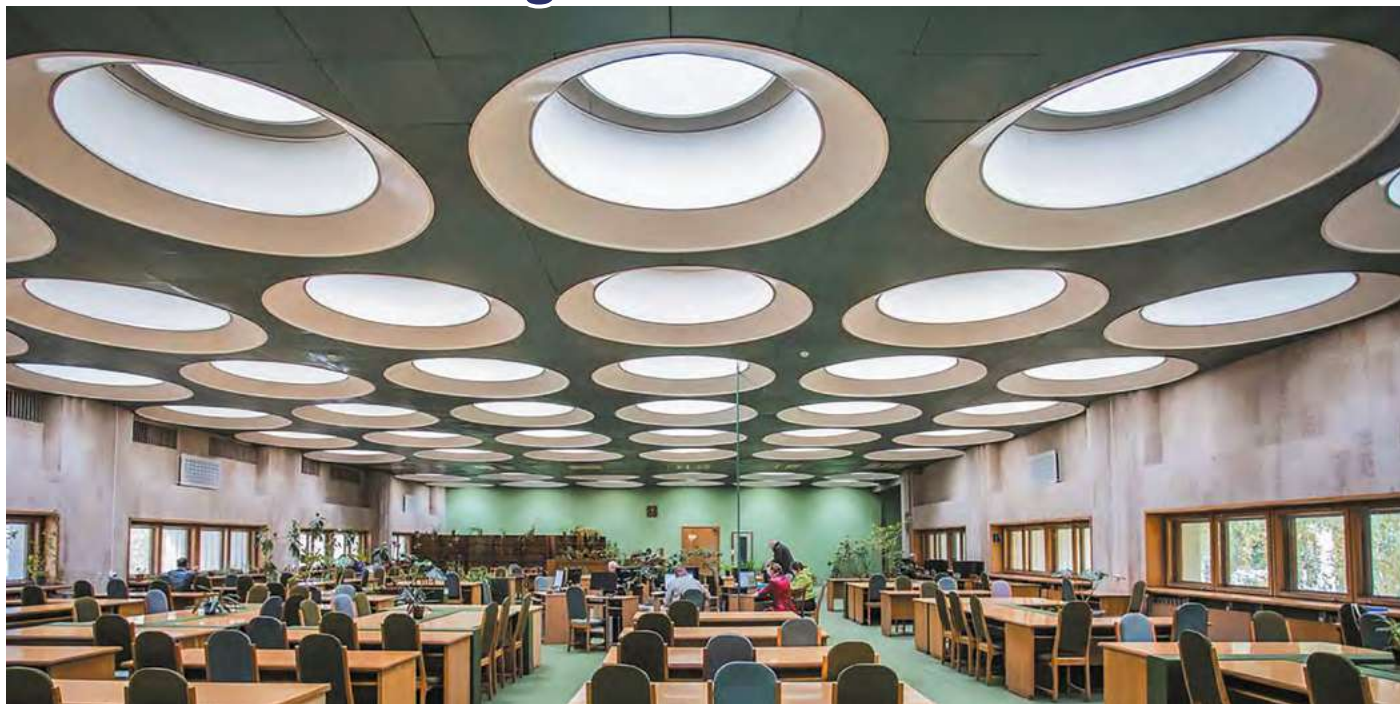


Roman Kuznev,
Suncloud:

— Unfortunately, Ukraine is going through very difficult times. This applies not only to energy, but also to all other spheres. As a result of the full-scale invasion, the volume of primarily solar energy increased. It became possible to make home power plants throughout Ukraine more accessible and easier to use. Now, a solar power plant is not just a “passive” income from a green tariff, but primarily

an uninterrupted power supply system. Solar energy is constantly increasing its volumes, every year there are more and more private and legal entities that use the sun for comfort and economy.

Vernadsky National Library of Ukraine: architectural heritage



The Vernadsky National Library of Ukraine is one of the most important cultural and educational centers of Ukraine. Its unique architecture of the main building and the building on Volodymyrska str., as well as the impressive interior of both buildings, emphasize the greatness and richness of Ukrainian culture and history. It is an indispensable resource for researchers, students, and anyone who values knowledge.

Founded on August 2, 1918, the Vernadsky National Library of Ukraine (VNLU) celebrated its 105th anniversary in 2023. It is the leading book collection in Ukraine, performs the role of a national center that combines library and information, science and research, methodological, cultural and educational functions.

The library is one of the largest national libraries in the world. A monumental 27-story skyscraper and an ancient building in the center of the capital are combined in a unique architectural project which are the buildings of the Vernadsky National Library of Ukraine.

Futuristic architecture of the main building of VNLU

The main building of the library is located on a 3 hectares land plot and was put into operation in 1989. The height of the building is 76.7 m (78.6 m with the spire). Useful area — 35,000 square meters. The architectural style is Soviet era modernism.

The building was built according to the project of architects Vadym Hopkal, Vadym Grechyna and Valery Peskovskiyi. It consists of two parts that form a single unit: vertical (book storage) and horizontal (stylobate part). The vertical part of the building has 27 stories. The steel frame of the high-rise part of the building, resting on a continuous reinforced concrete slab, is the basis of the load-bearing structures. This foundation was developed by the Kyivproekt institute. The maximum horizontal displacement of the top of the building frame under the influence of normal wind loads is 12.3 cm in the transverse direction of the building (or 1/700 of the frame height) and 7.2 cm in the longitudinal direction (or 1/1170 of the frame height). This part of the building was designed specifically for book storage, with minimal access



to light to prevent the destruction of books. This is an important aspect because light can cause fading and damage to documents. Also, it is in this part that there is a special shaft for transporting books from the upper floors, which greatly simplifies the library's work process. Due to the mentioned features, this part of the building is specially adapted to the needs of the library.

The horizontal stylobate part has 4 floors, reading rooms, exhibition halls and service rooms are located here. The building has 2 underground floors. The interior of the room is decorated with works of art of considerable artistic value. In the central vestibule there is a monumental and decorative panel *Pain of the Earth*, 300 square meters (authors Volodymyr Pasivenko and Volodymyr Pryadka), made in the encaustic technique. The main theme of the composition is the disclosure of the great purpose of science — protection of life on Earth. The lobby in front of the reading rooms is decorated with a triptych tapestry *The Origins of Slavic Writing* (authors Mariia Lytovchenko and Ivan Lytovchenko, size 7x3.5 m), made in the hand-weaving technique. Materials — wool, lurex. The composition of the tapestry is determined by the presence of columns that do not allow the entire area of the canvas to be perceived at the same time.

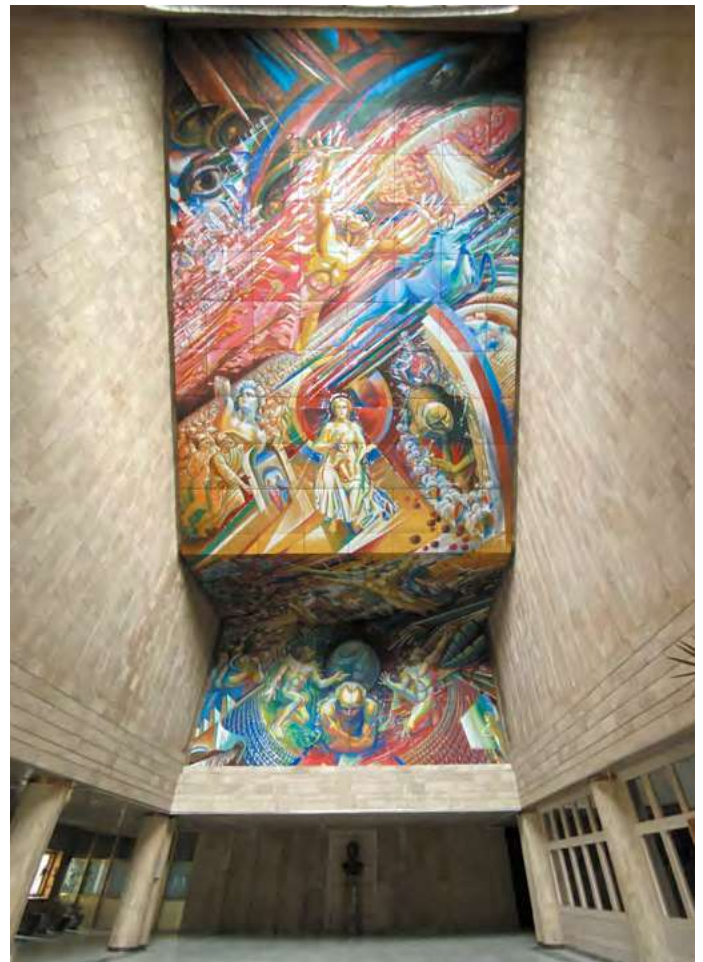
In total, the library has 14 reading rooms, which are designed for users to work with documents of the library fund and other information resources. Lighting in such rooms is provided thanks to acrylic light diffusers installed in the ceiling, which contributes to maximum natural lighting. In addition, windows are located along the wall. A carpet floor covering is used to reduce the noise level. These features are special solutions designed specifically for libraries to provide optimal conditions for reading and research.

Refined architecture of the library branch on Volodymyrska street

The building of the Vernadsky National Library of Ukraine on Volodymyrska Street, 62 is located in the historical center of Kyiv, is a historical monument of national significance of Ukraine and forms a single architectural ensemble with the main building of the Shevchenko National University. 2 architectural eras were combined here: Soviet modernism was added to neoclassicism. The interiors are decorated with bas-reliefs by Volodymyr Klymov, antique floor lamps from the collection of patron Fedir Tereshchenko, and bronze French sculptures.

Unlike the main building, the bookstores here are not so visible from the outside, but the 4-story building has 8 floors of bookstores. The total area of archival storage in this building reaches almost 11,000 square meters. The central reading hall of the building has a glass ceiling. One of the most elegant reading rooms in Ukraine is the reading room of the Old Prints and Rare Editions Department. Cabinets and other furniture in the halls of this department were created in 1782 for the library of the Polish King Stanislaw August in Warsaw Castle.

Vernadsky National Library of Ukraine is an important educational and cultural center with a unique architecture that reflects the greatness of Ukrainian culture. With its rich collection of books and impressive interior, it is an indispensable resource for all who value knowledge. The library is a popular venue for events such as presentations and conferences, and its space often appears in music videos and TV series. Thanks to effective architectural and engineering solutions, the library provides comfortable working conditions for its visitors and employees.



REBUILD UKRAINE POWERED BY ENERGY — an international platform for promoting investment opportunities for the economic transformation of Ukraine



On November 14-15, 2023, the International Exhibition and Conference ReBuild Ukraine powered by Energy was held at the EXPO XXI exhibition center (Warsaw, Poland). This event became a powerful public platform that united representatives of the state authorities of Ukraine and other countries of the European Union, charitable funds, investment companies, development agencies, international donor and financial organizations, territorial communities, state and private energy and construction companies of Ukrainian and European construction industry. The Prof Build magazine acted as the media partner of the event and actively participated in this grand and important event for Ukraine.

The purpose of the forum was to attract international funding for the restoration of Ukrainian communities, to assist Ukrainian energy industry enterprises in implementation of restoration of critical infrastructure facilities that suffered as a result of military aggression, as well as to attract investments to the cities and regions of Ukraine which today support millions of displaced families and have attractive investment opportunities.

The event, organized by Premier Expo, took place under the patronage of the Ministry of Energy of Ukraine with the support of the Ministry of Community Development, Territories and Infrastructure of Ukraine, the State Agency for Reconstruction and Development of Infrastructure of Ukraine, the Ministry of Economic Development and Technologies of the Republic of Poland, the American Chamber of Commerce and Industry in Ukraine and relevant ministries of the EU partner countries.

Visitors and guests of ReBuild Ukraine, which were 3,503 unique visitors from 45 countries, 34 per cent of whom were representatives of the construction and energy industries, were offered to observe unique exhibition with a total area of 13,500 square meters.

28 countries presented their exhibits (a total of 557) in 23 national pavilions. Among them were expositions of construction technologies, equipment and materials, modern electrical equipment and green technologies, world achievements in the construction and energy spheres.

The national pavilion "Ukraine and its communities" became one of the key elements of the exposition. 26 participating communities affected by the war (154 delegates) and 86 invited communities (127 delegates) were presented there.

The "Energy of Ukraine" exhibition presented by state companies working in the fields of nuclear energy, electric power, oil and gas industry, coal industry, "green" energy, etc. — attracted a lot of interest as well.

As part of the business program of Rebuild Ukraine powered by Energy was held an Intergovernmental press briefing of representatives of the authorities of Ukraine, the EU and other countries. Speakers from different countries discussed the key topic: how international development agencies, the non-governmental sector and charitable organizations implement projects in Ukrainian communities, and how this corresponds to the sustainable development goals. Leading architects and designers from all over the world exchanged experience and innovative ideas regarding the most modern trends in urban planning and architecture in Ukraine and abroad.

The Ministry of Energy of Ukraine acted as an organizer of the International Conference "Recovery of the Energy Sector of Ukraine. European integration. Modernization", and the main speaker was the Minister of Energy of Ukraine German Galushchenko.

This event was a follow-up for the successful first exhibition-conference Rebuild Ukraine which took place in February 2023 and exceeded all expectations and requests of the main stakeholders — international manufacturers, communities and partners from around the world. The event became a powerful and effective platform for discussing the issue of the strategic recovery plan, norms and procedures for involvement of international companies in the reconstruction process of Ukraine. The forum brought together 488 government and business representatives to discuss Ukraine's investment achievements in 2023 and outline plans for the next year.



RECOVERY CONSTRUCTION FORUM 2.0



On November 14, 2023, RECOVERY CONSTRUCTION FORUM 2.0 took place in Warsaw (Poland) as part of the international exhibition ReBuild Ukraine. The event became a unique platform for communication between the construction industries of the partner countries to accelerate the reconstruction of Ukraine. It was organized by the Confederation of Builders of Ukraine together with Premier Expo with the support of the European Construction Industry Federation (FIEC).

The forum brought together representatives of the state authorities of Ukraine and the countries of the European Union, financial institutions, Ukrainian and European construction companies.

The participants discussed already existing initiatives and the first results of reconstruction and emphasized the importance of recovery here and now.

The event was opened by the organizers: Lev Partskhaladze, President of the Confederation of Builders of Ukraine (KBU), and Olena Kononenko, head of the REBUILD UKRAINE project.

The RECOVERY CONSTRUCTION FORUM 2.0 program consisted of a number of open dialogues and discussion panels. In particular, during the Forum, an open dialogue was arranged with Mustafa-Masi Nayem, the Head of the State Agency for Reconstruction and Development of Infrastructure of Ukraine, who noted the importance of reconstruction already today and described the three main directions of the Agency work: the first priority is war, the second is export, and the third is critical and social infrastructure, its protection from shelling. Mr. Nayem noted that half of the large reconstruction project after the destruction of the Kakhovka Dam has already been completed, water supply has been restored in Kryvyi Rih, and soon all works on the main water pipeline will be completed.

“Although we are the Recovery Agency, but everyone is talking about survival now. The main part of recovery will happen after the war, and now we are trying to support and restore the critical one”, — emphasized Mustafa-Masi Nayem.

The Forum also hosted a discussion panel «Specifics

of the construction market of Ukraine and the first experience of reconstruction». It was moderated by Philip Crampton, President of the European Construction Industry Federation (FIEC), who noted that the recovery has already begun: «Ukraine has already begun to restore the infrastructure that was destroyed as a result of Russian aggression. In the political field, Ukraine is moving towards joining the EU. The goal we all strive for is to rebuild a better Ukraine, complying with international standards.»

During her speech on the state policy of the reconstruction of Ukraine, Nataliya Kozlovska, Deputy Minister of Community Development, Territories and Infrastructure of Ukraine, noted that today Ukraine is rebuilding in conditions of war and hostilities. The state budget financed the restoration of thousands of objects, in particular residential, social and engineering and transport infrastructure, which suffered significant damage, and which could be quickly restored and used.

In addition to lively discussions and speeches, two important cooperation agreements were signed at the RECOVERY CONSTRUCTION FORUM 2.0: the Memorandum of Understanding between FIEC and the European Federation of Building and Woodworking Workers (EFBWW) on sustainable reconstruction of Ukraine, and the Memorandum of Understanding on cooperation between the Confederation of Builders of Ukraine (KBU) and Confederation of the Confederation of Finnish Construction Industries RT (CFCI).

We are thankful to the organizers for the invitation, and we'll see you at RECOVERY CONSTRUCTION FORUM 3.0!



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