

Sofiya Lukyanchenko¹, Volodymyr Babyak², Igor Gnes³

EXPERIENCE IN USING MODULAR SOCIAL HOUSING

¹ *Master of the IAPH Department, Lviv Polytechnic National University, Lviv*

e-mail: sofiya.lukyanchenko@gmail.com

orcid: 0000-0002-2615-1953

² *Assistant Lviv Polytechnic National University, Institute of Architecture and Design, Lviv*

e-mail: volodymyr.babyak@gmail.com

orcid: 0000-0002-9672-0971

³ *Doctor of Architecture, Professor, Head of the Department of API,*

Lviv Polytechnic National University, Lviv

e-mail: ihor.hnes@gmail.com

orcid: 0000-0003-0810-7681

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Abstract. The modular architecture is currently actively used in construction since it has many advantages over traditional construction. This type of design simplifies and speeds up the process of creating not only social housing, but also campuses and hospitals when there is an epidemic and you need to quickly provide patients with wards, or get out of the housing crisis during the economic crisis. In addition to being practical, it is much cheaper and more environmentally friendly. This article provides examples of the use of modules in construction and architecture to argue the relevance and need to use modular architecture and develop it.

The use of the technology of modular formation of architectural objects can solve urgent problems in the modern world: overcoming the consequences of natural disasters, hostilities, the formation of social and niche specialized housing. These examples are not innovations that are unattainable or not scalable for technological reasons. The highlighted issue only shows the need to disseminate these solutions in practice.

Key words: modular construction, social housing, real estate market, housing for migrants, housing crisis, economic crisis.

Problem statement

Nowadays, there are many problems in the world with housing, or rather with the proper use of land to provide all people with housing given their economic opportunities. Most countries are now struggling with several issues such as:

- a large number of homeless people who can not afford full housing at market prices;
- housing crisis, as most European countries do not have time to build housing for the local population and the rate of influx of migrants;
- the cost of construction is unstable and is often an expensive pleasure because the market is constantly affected by economic crises;
- duration of construction.

The purpose of social housing is accessible housing to all segments of the population, i.e. it is cheap. To make it cheap, a modular method of assembling apartments or houses is often used. Nowadays, many construction and architectural companies offer their services to create a modular architecture. For example:

- CONCR3DE has created a new method of 3D printing, which allows you to print 3D parts with high expansion and high strength using concrete and most importantly at a low price.

- ECOGLOBE helps architects, engineers and real estate developers to make their projects more sustainable in the economic sphere.
- Woodyshousing offers high-quality modular housing for temporary or permanent premises.
- In May 2018, Icon for the first time offered and presented a 3D-printed house as a solution with a shortage of housing.

Objective of the article

The objective of the article is to draw attention to the use of modular architecture in construction and describe the experience of using modules for the construction of social housing.

Results and discussions

Modular architecture has a number of advantages and it is:

- Assembly of modules takes place in the premises, which helps to eliminate the payment for the downtime of workers and equipment on construction sites due to bad weather.
- Assembly of modules can be carried out during the year, regardless of what time of year it is. Thus, the modules can be prepared in winter and mounted on-site in the spring.
- The use of unified elements when mounting the module reduces the risk of errors, so the costs are more predictable.
- Due to the small mounting area of the module there is no large amount of heavy equipment. You do not need to prepare a large area to use the module.

One of the Chinese architectural firms Modular Social Housing (HKCSS is now developing three modular social housing projects [Electronic resource] // Modular Social Housing. – 2020. – Resource access mode: <https://modularsocialhousing.org.hk/en/existing-project>) is just purposefully developing modular arrays in Hong Kong for ordinary families and people living in inadequate living conditions. Modular Social Housing considers the problem of apartments with high rental costs and besides, most often they are socially isolated, so the company offers its services.

HKCSS promotes and develops social housing, not only addressing the housing problem but also seeking to help these low-income households build a community support network. With the help of the network, they could find more resources and support the community to improve their quality of life and gradually get out of poverty.

Modular Social Housing uses integrated modular construction because it is the most efficient, economical and environmentally friendly way to build transitional/temporary social housing.

The view of modular housing Modular Social Housing can be seen in Fig. 1.

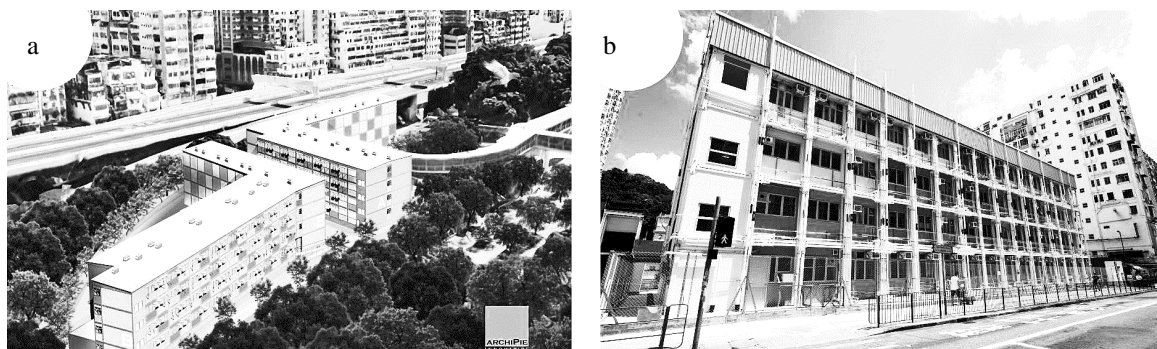


Fig. 1. Modular Social Housing Project on Yen Chou Street, Hong Kong (a);
Modular Social Housing Project on Nam Cheong Street, Hong Kong (b) (Nam Cheong Street Modular Social Housing Project [Electronic resource] // Modular Social Housing. – 2020. – Resource access mode: <https://modularsocialhousing.org.hk/en/content/nam-cheong-street-modular-social-housing-project>)

Another reason for using a modular architecture is speeding up the construction process. Sometimes in an urban environment, you have to go outside the site to carry out construction, but there is one nuance and that is that the time of construction, in this case, is reduced twice than if the construction took place only on your site. Off-site construction offers an accelerated schedule and a shorter funding period. An example of solving this problem with the help of modules is The Stack Modular Housing in Manhattan / Gluck + (The Stack Modular Housing in Manhattan / Gluck + [Electronic resource] // ArchDaily. – 2020. – Resource access mode:

https://www.archdaily.com/943491/the-stack-modular-housing-in-manhattan-gluck-plus?ad_source=search&ad_medium=search_result_all). This project is located on a small and complex site, which complicates the construction process.



Fig. 2. Method of mounting modules from the adjacent area using a crane (a); appearance of the external facade and volume (b); unloading of the assembled modules at the construction site in New York, USA (C) (The Stack Modular Housing in Manhattan / Gluck + [Electronic resource] // ArchDaily. – 2020. – Resource access mode: https://www.archdaily.com/943491/the-stack-modular-housing-in-manhattan-gluck-plus?ad_source=search&ad_medium=search_result_all)

This project by the architectural firm Gluck + has developed a quality and cost-effective housing solution for strategic restructuring and filling gaps in the city's outdated housing infrastructure. Besides, a very specific method of mounting modules in the structure of the building was used.

Although this is not mandatory for this construction methodology, the design of this 7-storey residential building expresses its modular design. Each unit is readable but is also read as part of a whole. A common misconception about “modular” design is that units are products; in each – a whole apartment with a certain design. Off-site construction is just an alternative method of construction. The building is designed according to his needs, and then “cut” into parts that can be completely manufactured at the factory, and then transported and installed in the intended place.

Another example of the practicality of temporary modular social housing is the situation in Rotterdam in 2018. The municipality and social housing associations of the Netherlands have started to order mass production of modular social housing at factories for the production of mobile mini-houses. Rotterdam has begun to create settlements for low-income citizens and announced plans to sell about 3.000 units of social housing (What do thousands of new social mini-houses in Rotterdam look like [Electronic resource] // Construction portal of new technologies. – 2016. – Resource access mode: <https://taratutenko.ru/kak-vglyadyat-tsyatchi-novh-sotsialnyh-mini-domov-v-rotterdame.html>). According to experts, the Netherlands will need about a million new homes by 2030, and of course, the traditional construction industry will not be able to do so much work. To alleviate the situation, the authorities have changed the requirements for new housing, because it is now possible to have a residential function in basements and attics. But the real successful breakthrough can be the mass production of inexpensive mobile modular homes. The country's Cabinet of Ministers is set to produce at least 75,000 mini-houses a year.

Mini-houses from the Heijmans company. As befits the implementation of a large-scale state program – first of all, standard samples of mobile mini-houses were selected and approved. The most popular option is offered by Heijmans because they took these houses and began to form new settlements in Rotterdam.

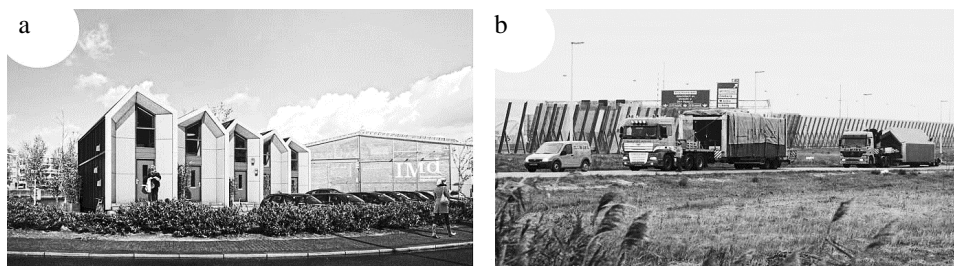


Fig. 3. View of mini-houses from the company Heijmans (a); transportation of a modular house (b) (What do thousands of new social mini-houses in Rotterdam look like [Electronic resource] // Construction portal of new technologies. – 2016. – Resource access mode: <https://taratutenko.ru/kak-vglyadyat-tsyatchi-novh-sotsialnyh-mini-domov-v-rotterdame.html>)

Conclusion

Nowadays, most European countries suffer from economic and social crises, which means that many people do not have the finances to rent or buy an apartment. It looks like a vicious circle that helps to open a

modular architecture due to its accessibility. Besides, many organizations that rent or sell social housing employ people who have settled in this type of housing. The experience of using modules is optimistic because with their help you can create an interesting volume or speed up construction, and also provide people with not only temporary housing but also permanent. It is necessary to develop this type of architecture and further seek the principles of forming a modular architecture, which will be not only affordable but also multifunctional and with the most efficient use of land, the amount of which is decreasing every year. If this industry is developed, it is possible not only to solve the problem of the housing crisis but also to make part of the housing market stable.

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Лук'янченко Софія¹, Володимир Баб'як², Ігор Гнесь³

¹ *Магістр кафедри ІАРД, Національний університет “Львівська політехніка”, Львів*
e-mail: sofiya.lukyanchenko@gmail.com

orcid: 0000-0002-2615-1953

² *Ассистент, Національний університет “Львівська політехніка”, Львів*

e-mail: volodymyr.babyak@gmail.com

orcid: 0000-0002-9672-0971

³ *д-р арх., професор, завідувач кафедри АПП,*

Національний університет “Львівська політехніка”, Львів

e-mail: ihor.hnes@gmail.com

orcid: 0000-0003-0810-7681

ДОСВІД ВИКОРИСТАННЯ МОДУЛЬНОГО СОЦІАЛЬНОГО ЖИТЛА

Модульна архітектура на сьогодні активно використовується в будівництві, бо має чимало переваг в порівнянні з традиційним будівництвом. Такий тип проектування спрощує і пришвидшує процес створення не тільки соціального житла, але й студентських містечок, лікарень, коли відбувається епідемія і потрібно в швидкі терміни забезпечити хворих палатами, чи вийти з житлового дефіциту під час економічної кризи. Окрім того, що такий метод є практичним він набагато дешевший та екологічніший. В цій статті наведені приклади використання модулів у будівництві та архітектурі, щоб аргументувати актуальність й потребу використовувати модульну архітектуру та її розвивати.

Використання технології модульного формування архітектурних об'єктів може вирішити термінові завдання в сучасному світі: подолання наслідків природних явищ, бойових дій, формування соціального та нішевого спеціалізованого житла. Наведені приклади не є нововведеннями, недосяжними чи не масштабованими через технологічні причини. Висвітлене питання лише показує необхідність поширення цих рішень у практиці.

Ще одна причина використання модульної архітектури, передбачає змогу пришвидшити процес будівництва. Іноді у міському середовищі доводиться виходити за межі ділянки, щоб реалізувати будівництво, але є один нюанс, і він передбачає, що терміни реалізації будівництва в такому випадку скорочуються вдвічі, аніж, якби будівництво відбувалось лише на своїй ділянці. Таким чином, монтування модульної архітектури не тільки надає змогу пришвидшити будівництво, але й зекономити фінанси в схожих ситуаціях, коли на ділянці немає можливості розмістити великогабаритну будівельну техніку.

Окрім цього, чимало архітектурних бюро розпочинає пропонувати не просто статичну модульну архітектуру, а зокрема ту, яка має змогу адаптуватися до різних кліматичних та топографічних умов. Це також надає шанс розробляти модулі для постійної експлуатації, а не лише для тимчасової. Такий метод трансформації непостійного житла під постійне враховує те, що модуль може доповнюватись іншою архітектурою під потреби замовника, що є дуже зручно. Тому, соціальне тимчасове житло з часом може стати постійним житлом для людей з різними вимогами та потребами.