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Analysis of the effectiveness of modular construction in Russia, taking into account foreign experience

At the beginning of the twentieth century, the society faced the need for high-quality and fast construction of housing, which led to the emergence and spread of modular construction. Modular construction is an alternative method for the implementation of capital construction, while the optimization of financial and labour costs, as well as the reduction of installation time frames are achieved precisely through the use of structural elements that are standardized. It can also be noted that at the moment, domestic practice needs to adapt foreign experience, using their recommendations when arranging the technological part of these structures. Analysis of domestic sources shows that for the development of modular construction, the support provided by the state is of particular importance, allowing the creation of new and development of existing regulatory and technical documentation that can cover various methods and materials for modular construction. That is, this direction actualizes the need to improve the current regulatory framework. Correct, full-fledged use of modular construction technology at the present stage of its formation requires regulatory technical documents. Turning to the research of international experience in the segment of modular construction, it can be noted that, for example, Great Britain has extensive experience in the field of construction of modular multi-storey buildings, aimed at expanding the volume of construction for citizens who are socially vulnerable. Despite the presence of positive trends, there are also factors that have a negative impact on the use of modular technologies. The main difficulty is the lack of the required regulatory framework, highly qualified specialists. There is also a lack of support from the state. These difficulties are not the only ones. Modular construction technology is being introduced slowly, while the creation of regulatory technical documentation would increase the speed of this process.

Keywords: modular construction, foreign experience, block modules, modular technologies, construction

In the modern world, modular construction has become widespread due to the ease of assembly and optimal construction times. At the moment, modular structures are used not only in housing construction, but are also actively developing in the energy sector, as well as the oil and gas industry [1].

The most common are mobile (temporary) buildings, structures with block containers with easy, quick assembly using standard tools, thanks to which it becomes possible to quickly erect utility towns, temporary warehouses and other structures.

If we pay attention to domestic experience, we can note that in the USSR, there was the use of volumetric block housing construction, which acted as a promising method for ensuring high construction speed. In the Krasnodar Territory, today there is a plant "OBD", founded in 1974 for the production of volumetric-block reinforced concrete elements for the construction of residential buildings¹ (Fig. 1, 2).

The production facility produces more than 50 modular units daily, each measuring 3.4 × 2.5 × 6.0 meters and providing 19.6 square meters of functional space. The production line allows for high construction rates — for example, since 2005, the construction of a 16-story apartment building has taken just over 30 days².

These modular units, thanks to their flexibility, are used in a variety of applications: from boiler equipment, water treatment facilities, and gas stations

to reservoirs and substations [2]. Companies that occupy leading positions in the segment offer comprehensive turnkey services for the creation and installation of complex engineering systems, covering the entire cycle — from initial design based on individual customer requirements to assembly, transportation, and work on site. Both standard and more complex modular components often include elements such as reinforced concrete panels, chimneys, facade panels and metal structures with ready-made finishing, as well as utilities, which significantly speeds up the construction process [3]. International experience also shows that modular buildings are being introduced more and more widely, especially in housing and public construction, while outpacing domestic examples. In Japan and the United States, the construction of compact housing is widespread, and capsule hotels, providing a secluded and comfortable space for relaxation, have already become part of the urban environment of many megacities, including Moscow, where such a hotel was opened at Sheremetyevo Airport in 2009 [4] (Fig. 3). Also worth noting is the Sleepbox Hotel Tverskaya, an innovative hotel for Russia, opened in 2013. It consists of modular rooms, and the interior of the hotel itself is 56 mobile capsules. The data is presented in two types — in the form of double and single rooms [5] (Fig. 4).

An interesting example of the use of modular technology is a five-star hotel in Huan, located on the shore of Lake Dongting (Fig. 5) with 30 floors and 17 thousand square meters. The construction period is 15 days. The implementation of this project involved 200 builders and 1 tower crane [6].

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¹ The trend of construction of modular buildings in the world. Article in the journal "Young scientist". URL: <https://moluch.ru/archive/469/103417/> (Accessed 08/22/2025).

² Modern modular construction. URL: <https://elar.urfu.ru/bitstream/10995/66309/1/978-5-8057-1012-5-2018-11.pdf> (Accessed 08/22/2025).

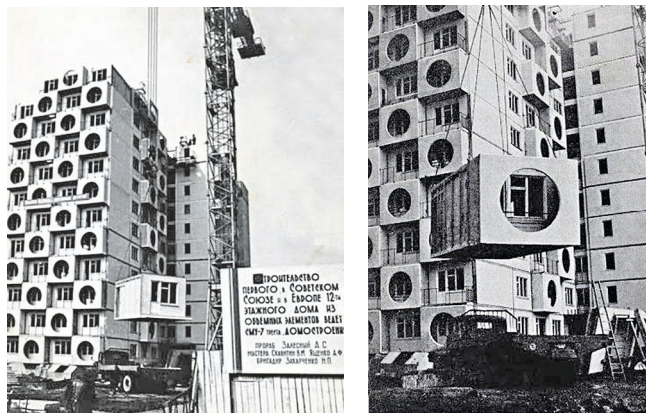


Fig. 1. The first 12-storey residential building of the BKR-2 series in the USSR and Europe. Krasnodar, Gidrostroiteley microdistrict, 1977



Fig. 2. Typical series of house BKR-2



Fig. 3. Capsule hotel at Sheremetyevo airport



Fig. 4. Sleepbox Hotel Tverskaya capsule hotel made of modular rooms — “sleepboxes”



Fig. 5. T30 Hotel in China, BROAD Group

The project was developed and implemented by BSB (Broad Sustainable Building).

The plant performed work related to the installation of communications, grooves and pins were provided to simplify the assembly process with an error of up to 2 mm, which indicated that there was no need for additional measurements or adjustments. During the construction of the building, the builders felt the need to connect the finished, fitted parts with the subsequent installation of

floor slabs in place of the walls, extending electrical networks and other communications. These actions created the foundation of the building. In accordance with the installation of load-bearing structures, stairs and external walls were installed, the thickness of which was 15 cm. The technology for external wall finishing was simplified as much as possible. It was also prefabricated: fastenings on load-bearing columns for heating structures, insulation, etc. [7].

Modular units in this case are individual frame elements that were manufactured at the plant, not requiring additional actions for their installation at the corresponding construction site³. When analyzing different implementation principles, it becomes obvious that a volumetric element that is fully factory-ready, where there is a geometrically unchangeable metal frame, is common in other countries [8]. It is used directly in individual housing construction, construction of public medical buildings, and other public buildings with repetitive planning solutions (hotels, educational, childcare facilities, etc.).

The financial advantages of working with this technology are already quite obvious at the stage of preparation for the implementation of the project, but still the main trump card of this method of building construction is time optimization and a faster return on investment. The modular structure is created and assembled in an industrial format with parallel preparation of the site, which means that often by the time the parts of the object are manufactured, the site is already completely ready for their installation.

For example, a modular hotel can receive its first guests and begin to return the initial investment by 30–50 % earlier than a hotel built in the classical way [9]. This is due to the fact that such buildings can be erected without a foundation on a pre-prepared base. An undeniable advantage of the technology in terms of the need to carry out work quickly and in a complex location is the lack of need to use large construction equipment. Any labour-intensive processes in this case are minimized or completely absent.

In the context of the feasibility of choosing a development project implemented using modular technology, such a parameter as space limitations is often of significant importance. Therefore, a modular design is a universal solution not only when developing territories outside cities, but also in the case of dense development. Thus, in ancient European cities, sites are often limited by roads and dense development⁴. Also, the classic format of work is associated with the constant delivery of materials and workers over a long period of time, which can significantly increase the cost of the project. And in the case of prefabricated buildings, significantly fewer personnel, equipment and time are required to implement the work.

Thus, working with modular structures helps to make an investment and construction project less dependent on market conditions, which is extremely important in a complex and unpredictable economic environment. The parameters of the object are much easier to adjust after the creation of the basic infrastructure. Given that market demand may fluctuate during the development cycle, the modular design potentially simplifies the implementation of complexes without large cash outlays. The advantages of modular construction are presented in Table 1, and the disadvantages are discussed in Table 2.

Optimizing the process not only reduces the time required to complete a project, but also reduces costs. Minimizing the crew, delays, and materials during the design and construction of a building means that choosing a modular design can reduce costs by up to 20 % [10].

The transition to modular construction opens a new path to sustainable development and ecology, because this technology allows to significantly reduce the amount of waste traditionally generated during construction. The controlled and concentrated nature of the production of modules actually slows down the pollution of nature, preventing the spread of harmful substances into the environment.

³ Materials_Practice_Guide_Modular_Construction_ru.pdf. URL: https://steel-development.ru/images/projects/downloads/Materials_Practice_Guide_Modular_Construction_ru.pdf (Date accessed: 08.22.2025).

⁴ BROAD Garden A1 — Modular Building Institute. URL: <https://www.modular.org/awards-broad-garden-a1/> (Accessed 22.08.2025).

Table 1. Advantages of modular construction

Advantages	Construction and installation take a minimum of time
	Savings compared to any traditional technologies. Less time to build a house helps reduce costs
	The production of modules is carried out in indoor workshops, so it does not depend on the weather. After the completion of the work, there is no need to remove construction waste from the site
	Reliable insulation circuit (since modular houses do not have bay windows and other complex architectural details, as well as curved surfaces)
	No strong foundation required
	Modular construction is also possible on sites with complex terrain
	There is no need to worry about the building settling, so finishing can begin immediately after installation is completed

Shifting the main work to closed and controlled conditions significantly reduces the likelihood of industrial injuries among workers and minimizes the public risk associated with the fall of building materials and the release of harmful fumes, increasing safety at the construction site.

However, modular construction is not without its drawbacks that cannot be ignored. One of the key disadvantages is the size restrictions of the modules, due to the difficulties of their transportation, which can become a critical problem under certain conditions.

Table 2. Disadvantages of modular construction

Flaws	Limited maximum height
	The range of available solutions in terms of architecture and planning is very limited
	There may be problems with the delivery of blocks to the site
	High cost of transporting blocks and modules
	It is necessary to equip effective supply and exhaust ventilation
	Manufacturers indicate the service life of a modular building at 50–70 years, which has not yet been confirmed by time

In addition, there is a certain concern about the quality of modular buildings, which may affect the resale price of the property. This factor sometimes affects the perception of the long-term value of such properties in the real estate market. Financial institutions are also cautious about financing modular homes, partly because the banking system may not be fully familiar with the specifics of the modular process and the prepayment required to begin construction [11].

Another feature is that the prefabricated blocks for modular construction are standardized: they are assembled on a conveyor belt. Each manufacturing company has its own prefabricated projects of modular houses with established possible options for the layout of the blocks, i.e. the organization of the interior of the building. For this reason, it is not possible to change certain characteristics, including: the area of the house, the layout, the design (for example, changing the location of the stairs, increasing the height of the ceilings, etc.) in accordance with the wishes of the customer. Thus, analyzing the advantages and disadvantages of modular technologies, one can note their positive development trend in the modern world, but one should also take into account the need to develop measures to improve the technological procedure for implementing investment and construction projects implemented using modular technology.

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Анализ эффективности внедрения модульного строительства в России с учетом зарубежного опыта

В начале двадцатого века в обществе появилась потребность качественного и быстрого возведения жилья, что стало причиной появления и распространения модульного строительства. Модульное строительство представляется альтернативным методом для реализации капитального строительства, при этом оптимизация финансовых и трудовых затрат, а также сокращение временных рамок монтажа достигается именно за счет применения конструктивных элементов, являющихся стандартизированными. Также можно отметить, что на данный момент отечественная практика нуждается в адаптации иностранного опыта, используя их рекомендации при устройстве технологической части данных конструкций. Анализ отечественных источников показывает, что для развития модульного строительства особое значение имеет оказываемая государством поддержка, позволяющая создавать новую и развивать существующую нормативно-техническую документацию, которая сможет охватить различные методы и материалы для модульного строительства. То есть данное направление актуализирует потребность в совершенствовании действующей нормативной базы. Корректное полноценное использование технологии модульного строительства на современном этапе своего становления нуждается в нормативных технических документах. Обратившись к исследованиям международного опыта в сегменте модульного строительства, можно отметить, что, например, у Великобритании имеется богатый опыт в сфере возведения модульных многоэтажных домов, направленный на то, чтобы расширить объемы строительства для граждан, являющихся социально уязвимыми.

Несмотря на наличие положительных тенденций, имеются и факторы, оказывающие негативное влияние на использование модульных технологий. В качестве основной трудности выступает отсутствие требуемой нормативной базы, высококвалифицированных специалистов. Также отмечается наличие нехватки поддержки от государства. Указанные трудности не являются единственными. Технология по модульному строительству внедряется медленными шагами, тогда как создание нормативной технической документации позволило бы повысить скорость указанного процесса.

Ключевые слова: модульное строительство, зарубежный опыт, блок-модули, модульные технологии, строительство

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