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STAGES AND TECHNOLOGICAL SOLUTIONS OF THE FACADE SYSTEM DESIGN PROCESS

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Annotation: This article provides a systematic analysis of the influence of modern facade elements on the internal microclimate, heat, and air exchange processes of buildings, and provides recommendations for determining optimal parameter ranges.

Keywords: facade systems, walls, buildings, brick.

"Currently, facade systems and structures are widely used both for finishing the facades of new buildings and for the repair and reconstruction of old houses." One of the reasons for the active use of suspended ventilated facades is the convenience of installation and subsequent maintenance. Furthermore, serious advantages include the fact that ventilated facades are quite unpretentious regarding the preliminary preparation of external walls. A number of Russian cities have a high share of development in their structure. In the 1960s, the problem of improving housing conditions was acute—people settled in dormitories and barracks. It was necessary to resettle them, and queues formed at enterprises because every industry received money for the social sphere, including housing" [1]. Construction in the country continued until 1985. During this period, approximately 290 million square meters of housing were built, which accounts for approximately 10 percent of the country's total housing stock [2-3]. The standard service life of mass-built residential buildings is provided in Table 1.1 [4-5].

Table 1.1-Normative terms of operation for mass-building residential buildings

Home type	Time buildings	Term exploitation	Demolition time (normative term)
1	2	3	4
Stalin's pre-war	1930-1940	125	2050-2105
Stalinist post-war	1945-1955	150	2095-2105
Panel	1955-1970	50	2005-2020
"Five-story" brick buildings	1955-1970	100	2055-2070
Panel and Block 9-16 multi-story	1965-1980	100	2055-2080
Современные кирпичные и монолитные	1980-1998	125-150	2105-2150
Modern panel	1980-1998	100-120	2070-2105

The reinforced concrete structures of the panel residential buildings are designed for 50 years of operation. In reality, such houses can serve for 10-15 years longer than the project provides. The extension of the life cycle can be achieved through regular repairs, as well as the correct operation of the building. It should be understood that repair of a separate apartment has no effect on the condition of the house: the house will not become less dilapidated from this.

Currently, the aforementioned houses are both physically and morally obsolete and require inspection and reconstruction. The reconstruction of such residential buildings must provide for increased capital investment, improvement of space-planning solutions, and insulation of enclosing structures. Analysis of technological and technical solutions for insulating external walls has shown that for Russia, with its predominantly unstable climatic conditions, the most rational consider the production of work based on the maximum use of prefabricated and small-piece cladding elements without "wet" processes. The NVF system is such a solution" [3]. From

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the faded, sunburnt facades of standard "Khrushchevka" and other late Soviet-era houses, one can create stylish, bright, and memorable color accents of the city only by reconstructing the facade using the necessary color combinations and techniques. These simple techniques will be able to bring variety and visual comfort to the homogeneous and therefore "oppressive" monotonous plane of building facades, which create the impression of being "abandoned."

Preserving the existing fund of buildings and structures and maintaining their functionality is one of the most important tasks solved during the design of facades. Professional preparation of the foundation creates an ideal foundation for constructing a functional, durable, and visually memorable facade. The use of suspended ventilated facades allows, firstly, "clothe" the facade with the latest finishing materials, and secondly, improve the thermal and sound insulation indicators of the external structure and make it more resistant to harmful atmospheric influences.

Only the issue of payback remains open. During the reconstruction of the building's enclosing structures using facade systems with ventilated air gaps, one-time costs for their installation do not pay off due to certain factors (expensive components of the facade systems, low heat energy tariffs, high bank loans). The durability of such structures is a maximum of 50 years. The payback period for one-time costs for the installation of the most economical of the facade system is from 45 to 50 years [6-7-8].

To reduce the payback period for one-time costs for the installation of ventilated facades, research is required, the result of which will be the development of new economical facade systems. In the current, already established market for facade systems in Russia, systems with an aluminum frame are in first place in terms of use, followed by those with a galvanized steel frame and those with stainless steel frames.

Among the existing external finishing construction systems with or without insulation in many cases, the use of suspended ventilated facades is justified, and in some cases, it is the only possible solution. According to research, the insulation value of external walls (in thousand square meters) suspended facade systems with an air gap, applied in Russia since 2008 according to statistics, is graphically depicted taking into account the forecasted data (Figure 1.1).

Regarding new construction, the share of the use of suspended structures ventilated systems with an air gap across the main segments of the real estate market from the total consumption is presented in Figure 1.2.

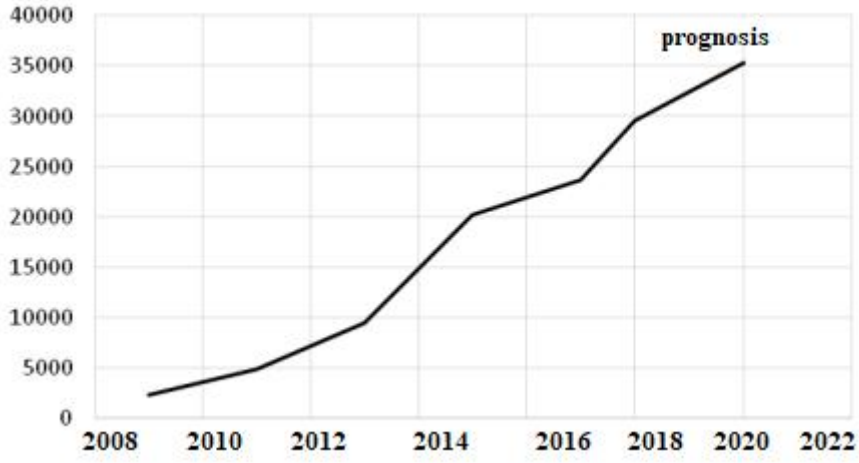

Figure 1.1 - Application of the NVF system with an air gap.

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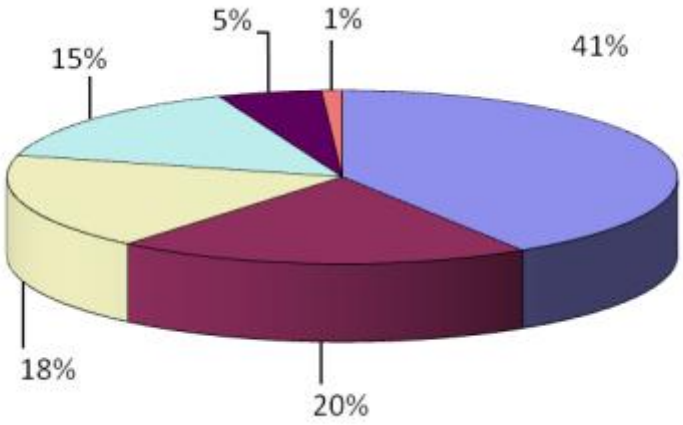

Figure 1.2 - Share of NVF use in real estate properties

This, the use of this external wall insulation system will be promising and in demand for many years to come.

Modern ventilated facades are complex multi-layered structures used during the construction of various buildings and real estate objects for facade cladding (external walls). A ventilated facade is a suspended structure that, thanks to the modern materials used, is distinguished by a long service life without repair, reaching 50 years. Suspended structure of the ventilated facade is shown in Figure 1.3.

Ventilated facade systems are based on a frame structure and consist of the following components:

1. Finishing panels performing the protective function of a barrier (screen) that prevents the impact of moisture, wind, sun, etc., on the insulator. In addition, the outer part of the ventilated facade (covering panel) performs a decorative function. The ventilated facade ensures an attractive and aesthetic appearance of the building;

2. Insulation based on mineral or glass wool, adjoining the wall. One of the most important aspects of execution of suspended ventilated facades is the gap left between the insulation and the UVF protective screen (covering). Due to this (small) gap, the free circulation of air masses occurs, which in turn prevents the insulation and the facade from becoming damp, and such an "air cushion" is an excellent thermal insulator.

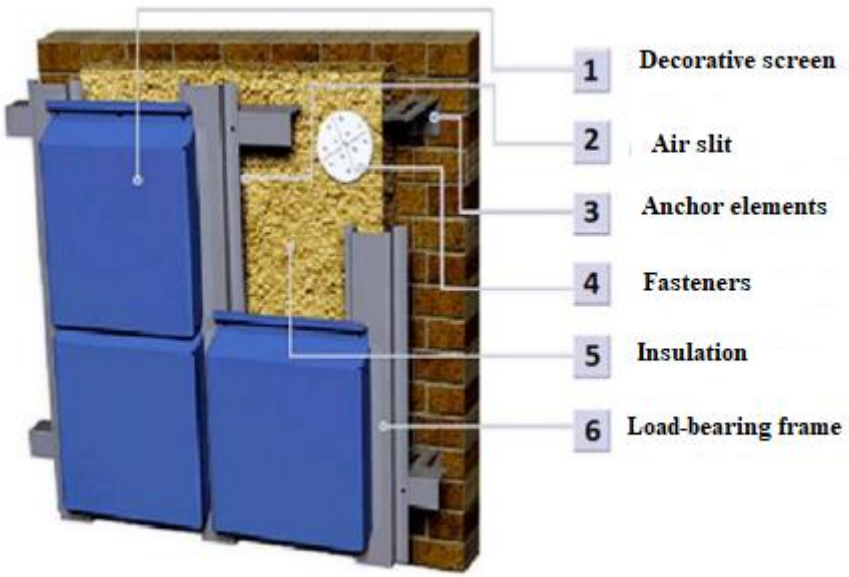

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Figure 1.3 - Design of ventilated facade

The facade cassettes themselves are also secured at some distance from the building's external surface, which ensures air ventilation and the drying of the facade. Facade cassettes are fixed to the surface of the building at special structures and fittings. Due to this type of reinforcement, ventilated facades are called suspended.

The facing structure (a subsystem of ventilated facades) consists of brackets that are attached directly to the wall using an anchor (the type of anchor is individual and depends on the wall structure). To brackets with self-tapping screws or rivets are used to secure the load-bearing profiles, to which the facing material is attached using special elements.

Ventilated facade subsystems meet the following requirements:

- reliable fastening to the wall;
- reliable fastening of the facing material;
- ability to hide (level) wall irregularities;
- can withstand design static and dynamic loads.

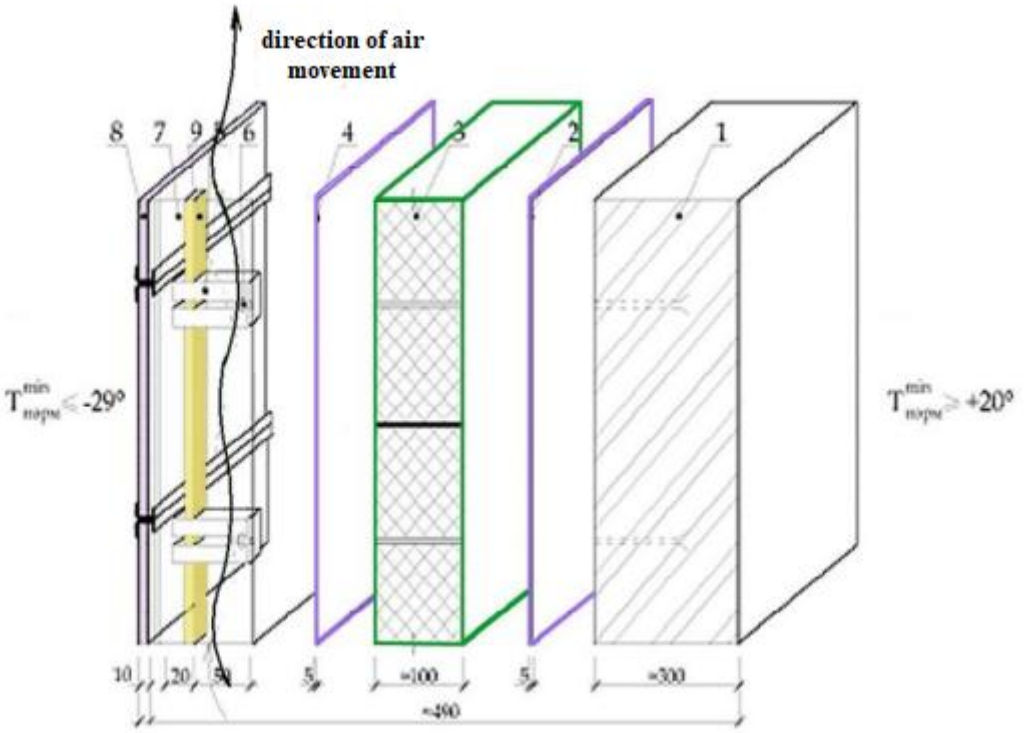

Figure 2.1 - Functional model of a suspended ventilated facade device according to the cost minimum optimization criterion [8]

1 - load-bearing wall: monolithic concrete;
2 – glue;
3 - insulation: mineral wool slab;
4 – wind and waterproofing film;
5 – horizontal steel guides;
6 – umbrella troughs;
7 – steel vertical guides;
8 - vinyl siding;
9 – ventilated air layer.

Conclusion

1. The possibility of installing suspended ventilated facades made of ceramic granite slabs for existing buildings has been substantiated.

2. Scientific and technical achievements regarding the execution of work on the installation of suspended ventilated facades made of ceramic granite slabs have been summarized.

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LIST OF USED SOURCES

1. Александровский, С.В. Долговечность наружных ограждающих конструкций ; М., НИИСФ РААСН, ГУЛ НИИЖБ ГНЦ «Строительство», 2004. - 332 с.
2. Афанасьев, А.А. Реконструкция жилых зданий. Часть I Технологии восстановления эксплуатационной надежности жилых зданий/ А.А. Афанасьев, Е.П.; Библиотека гостов и нормативов, М.: 2008 Web: http://ohranatruda.ru/ot_biblio/normativ/data_normativ/53/53642/
3. Бабков, В.В. О надежности и долговечности навесных фасадных систем / В.В. Бабков, Г.С. Колесник, В.А. Долгодворов, Г.Т. Пономаренко; Строительные материалы. - 2007. - №7. - с. 24-26.
4. Батрак, В.Е. Метод оценки долговечности теплоизоляции при действии эксплуатационных нагрузок / В.Е. Батрак, В.В. Бобряшов, В.М. Бобряшов; Труды I Всероссийской научно-технической конференции «Строительная теплотехника: актуальные вопросы нормирования». – Санкт-Петербург, 26-27 июня 2008г. - с. 76-85.
5. Ватин, Н.И. НВФ: основные проблемы и их решения / Н.И. Ватин, Д.В. Немова; Мир строительства и недвижимости. - 2010.- № 36. - с. 2-4.
6. Воробьев, В.С. Оценка долговечности многослойных ограждающих конструкций / В.С. Воробьев, Н.П. Запащикова; Современная наука: теоретический и практический взгляд. – Уфа: АЭТЕРНА, 2014. - с. 15-17.
7. Горшков, А.С. Методические основы решения проблемы долговечности ограждающих конструкций зданий / А.С. Горшков, М.В. Кнатько, П.П. Рымкевич; СтройПРОФИль. – 2009. - №3(73). – с. 112-113.