

Translation from Russian

"Aluminum glazing. Expert advice and examples of work"

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Comparing prices for aluminum windows – what to choose?

Chapter 1

Accordion sliding doors – pros and cons

Sliding and folding doors are a convenient option to close a doorway while maximizing the use of space. But not all accordions are equally reliable. There are many varieties of accordion doors on the market, from inexpensive interior doors to premium folding glass walls. I, Artem Volkov, an expert in aluminum glazing, will help you understand this abundance and make the right choice of sliding accordions.



Types of sliding accordion doors

Sliding accordion interior doors were popular 10-15 years ago. They were often installed in the kitchen and bathroom and as accordion sliding doors for the dressing room. This would be a good solution if these doors were made of reliable material. Buy a sliding door You could buy an interior accordion at any hardware store. In their current design, according to reviews, they resemble a sliding screen

rather than a door with good sound insulation. Light, sound and smell came through these plastic accordion sliding doors with a bang. Today, flimsy interior doors - books with a similar name only discredit modern accordion doors. My goal, as an expert, is to convey to buyers the most useful information about the varieties of real accordion doors and help with the choice.

An accordion is a folding door consisting of several leaves. One of them opens in a swing position, it is used as a regular door for passage. The remaining doors form a glass wall, and, if necessary, fold in one direction or in different directions.

In the folded position, the accordion opens the opening almost completely, while the doors take up very little space. There are no vertical crossbars in folding doors; tight fit of the leaf leaves to each other is achieved using a Z-shaped and T-shaped profile with seals. The minimum number of sashes in an accordion is two. Single-leaf accordions are not produced.

Accordion sliding folding doors are made of plastic, wood and aluminum. The opening device and fittings for folding doors are the same for all. Significant differences between them are in maximum dimensions, permissible number of sashes, ease of use, safety and appearance.

For those who are worried about the invasion of mosquitoes and other insects through a large open doorway, a special mosquito net can be easily installed on a high-quality folding door book. Accordion mesh on the door produced in the same dimensions as the door itself. The accordion mesh canvas moves to the side and hides in the box.



Plastic accordions

Accordion doors made of plastic profiles are a common and affordable type of accordion due to their cost. Not every profile system is suitable for manufacturing, so not all manufacturers have them in stock.

The maximum dimensions of plastic folding doors are 6000 x 2800 mm (width x height), but these must be checked with the manufacturer. It is not recommended to have more than seven leaves in one book door due to their heavy weight. Suitable

for both indoor partitions and as entrance doors. The minimum permissible dimensions of the sashes - height 600 mm and width 450 mm - allow the use of folding sashes in windows.

Advantages of plastic accordions:

- Affordable price from RUB 40,000/sq.m.
- Wide range of colors
- High rates of heat and sound insulation

Disadvantages of plastic accordions:

- Most models have a high threshold (60 – 70mm), making it inconvenient to step over and transport the stroller.



- Solid overhead hinges for folding doors, in my opinion, do not decorate the structure and are difficult to match to the color of the profile. Another

dubious decoration of the plastic accordion is the metal guides along which the doors slide. They are installed at the top and bottom of the structure and look quite bulky. Debris gets into the lower guide, which does not contribute to the smooth operation of the fittings mechanism.

- And most importantly, the frame of the plastic accordion door is welded in production and arrives at the site in finished form. This is a serious problem when moving a structure into an apartment or office. When ordering, the issue of transportation must be discussed with the measurer. I have seen collapsible plastic frames, but this is the exception rather than the rule. Self-assembly of a folding accordion door will require the owner to have good skills in working with tools and accuracy - the slightest failure to maintain the level when installing the frame into the opening will lead to serious problems when hanging the sashes and their operation. For this reason, I strongly recommend using the services of qualified installers.

Wooden accordions

Everything said above about plastic accordions also applies to wooden structures, with the exception of the cost - it is 2 or more times higher than plastic.

Of the special advantages, I will note the appearance; in some interiors only natural wood is acceptable.



Delivery of wooden structures is always more difficult than others - they are the heaviest and are easily damaged. Therefore, you will have to look carefully at the dimensions of the wooden accordion so that it fits in the stairwell and other narrow places without the risk of touching the corners and railings.

Aluminum doors - accordions

Aluminum structures are my area of expertise. But that's not why I praise aluminum accordion doors. They are objectively the coolest of all. Aluminum, as a material, is more technologically advanced and more reliable than its competitors, and its capabilities can never be compared with either plastic or wood. When choosing a material for such a complex structure as a door - accordion, my advice - definitely aluminum. A favorite on my list of preferences is the ALT BF73 system from Alutech.



Next, I will tell you in detail what kind of doors this system allows you to make, and why I give it preference. I'll start with the nuances of choosing an accordion - which type is suitable for which room.

How to choose an accordion door

We will choose from all possible options.

Folding plastic interior accordion (aka screen or door - book)

Since the plastic door is absolutely frivolous in design, it is recommended to install it in not very important places - a pantry, dressing room, mezzanine. Perhaps homely owners will be able to adapt such structures as sliding wardrobe doors. As a door to the kitchen or bathroom, a sliding door - an accordion, in my opinion, is not very suitable - it is a leaky design, it will not stop the smell and noise.



You can buy a single-leaf or double-leaf accordion interior sliding door inexpensively at Leroy construction hypermarkets or companies that sell interior doors.

Plastic and wooden interior sliding sliding doors accordion

These are warm, quiet and airtight sliding interior and exterior versions of accordion doors. They are used both indoors and as exits to terraces, verandas or as an entrance group. This is an affordable way to make soundproof interior partitions - for this purpose you will have to look for accordions with a relatively flat threshold. Conventionally, because the lower part of the frame will have to be recessed into the floor, which means that during installation it will be necessary to groove or raise the floor level. How expedient this is is up to you to decide.

Aluminum interior and exterior accordion sliding door

Among the aluminum systems there is a profile specially designed for accordions. This is the fundamental difference between aluminum accordion doors and plastic ones. For folding PVC doors, standard window and door profiles and fittings are used, supplemented with a sliding mechanism.

Aluminum accordions are made from profiles designed specifically for folding book doors. A striking example of this is the ALT BF73 folding door system with a flat, warm metal threshold. It produces stylish, minimalistic designs without unnecessary bells and whistles and at the same time more functional.

Installation of an aluminum accordion during installation does not require special preparation of the floor, either as an interior door or as an entrance door.

Accordion door dimensions

The sizes of accordions are limited by the capabilities of the fittings and restrictions on the profile.

- Ready-made plastic accordion screens have the size of a standard interior door - 0.9 x 2.05 m. You can buy a non-standard size upon request.
- Plastic and wooden accordions reach dimensions of 6 m wide, sash height up to 2.8 m and width 0.9 m. Maximum weight up to 100 kg.
- Aluminum accordions are champions in the “sizes” section. Accordions up to 15 (fifteen) meters wide are made from the ALT BF73 system. Sash height up to 3 meters, width up to 1.2 m. Maximum weight 120 kg.

Design options

The choice of accordion design depends on the material and the overall stylistic decision of the interior.

- Simple accordion-books are produced plain painted or covered with a film with a wood pattern.
- Plastic accordion doors are laminated with film on one or both sides and painted with water-soluble paints according to the catalog. The latest “fashion” is light shades of gray and imitation of aged wood.
- Wooden structures are coated with transparent or tinted varnish, preserving the wood grain, or covered with covering paint.
- Aluminum door profiles for accordions can be powder-painted in any RAL color, decorated with wood-look film or anodized - this is a super-resistant metal coating that forms on the profile itself and cannot be removed.

Advantages and disadvantages of aluminum accordions

The Alutech BF73 system is an exclusive solution for panoramic folding doors. Accordions made from ALT BF73 are installed in residential buildings, offices, hotels, restaurants; there is not a single facility where they cannot be used.

Advantages of accordions:

- **Perfect look**

There are no protruding tires or bulky overhead loops on the Alutech BF73 accordions. Thin roller hinges are installed in the groove of the profile and are small in size; they do not attract attention. I have already spoken about the possibilities of decorating the profile. A wide choice is available to the designer or buyer. Make an accordion with a black mirror glossy surface of the profile or a matte steel color, decorate it with wood, or choose one of nine shades of anodizing with a delicate metal sheen - there are a lot of options.

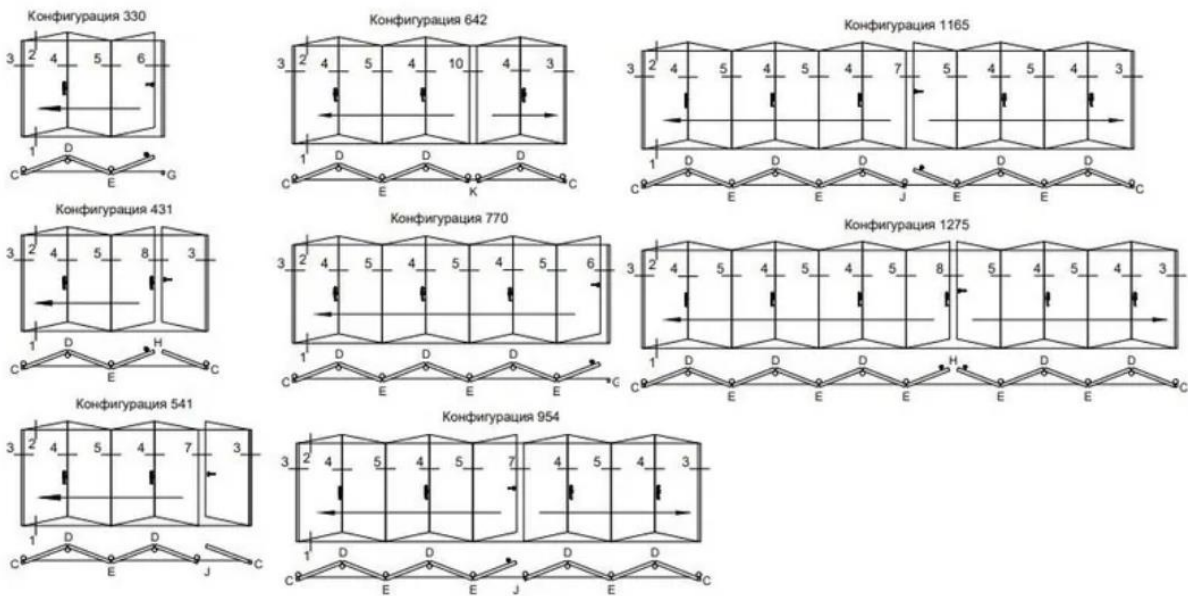


- **Gigantic sizes**

The Alutech BF73 accordion allows you to close an opening of 15 x 3 meters, in fact it is a collapsible wall. The size is more than twice that of competitors made from other materials.

- **Convenient opening pattern for you**

The Alutech BF73 system provides the ability to produce accordions with 35 opening options. Your door will fold the way you want.

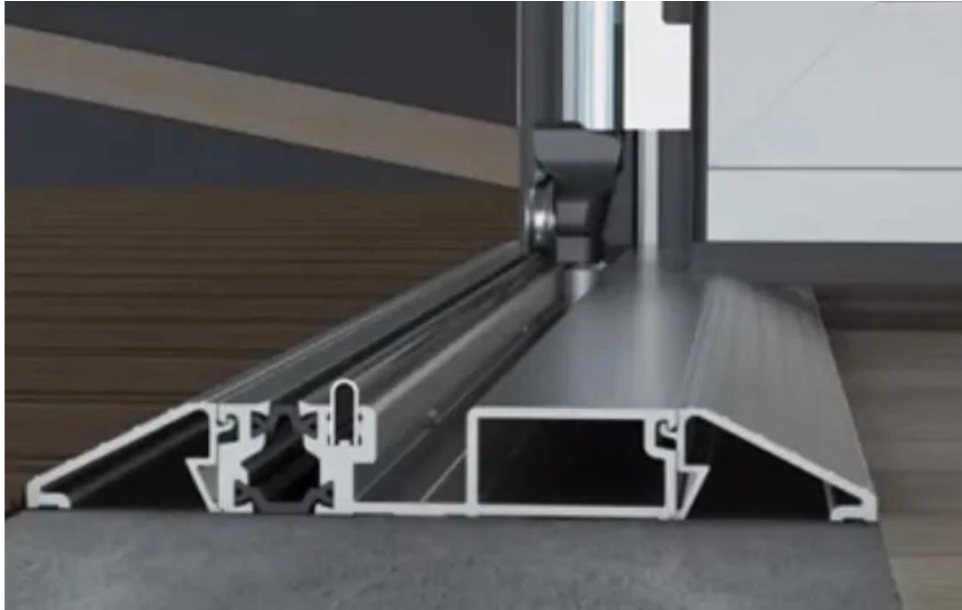


- **Space saving**

The accordion doors of the ALT BF73 fold outward or inward. With limited internal space, external folding of the doors allows optimal use of space. Convenient to use for glazing the exit to the balcony.

- **Barrier-free access**

The threshold of the accordion ALT BF73 protrudes above the floor by 20 (?) mm. It is impossible to trip over it; a child's stroller or wheelchair can easily cross the threshold.



- **Easy opening, accessible to children**

The doors slide easily on a stainless steel rail. The tire is part of the frame, so the entire load from the weight of the sashes is directed downward, and not to the side, like competitors. The doors always stand level in the opening and do not warp.

- **Heat preservation**

The heat transfer resistance coefficient, by which thermal insulation is assessed, reaches $0.8 \text{ m}^2 \text{ }^\circ\text{C} / \text{W}$. For comparison: the minimum required indicator for Moscow and the region is 0.66 .



- **No blowing**

The Alutech BF73 system uses two circuits of flexible and durable EPDM seals. In the corners of the sash, the seal is connected with special corners, which completely eliminate the possibility of blowing.

- Burglar protection without bars

Alutech BF73 working walk-through doors are equipped with multi-point locks with drop-out bolts with burglary resistance level RC 2. Door resists burglary for up to 15 minutes. Each sash is equipped with an element that prevents it from being lifted using a crowbar.



An important nuance is that the glazing beads (profiles holding the glass unit in the opening) are always located indoors. It doesn't matter which way the accordion folds, outward or inward, it is impossible to remove the double-glazed windows. A protective grille is not required with this type of accordion.

- **Durability**

The resistance of structural elements to corrosion and fading for 50 years and the absence of the need for adjustment ensure a long life cycle of ALT BF73 accordion doors. These are doors from the “set and forget” category.

There is one drawback to the accordion sliding interior door - the price. Although, in my opinion, this is a relative parameter. At the time of sale - yes, the price is higher than competitors. But if you divide it into years of trouble-free operation, then a year of ownership will be cheaper than cheaper options for book doors.

- **Folding Door Manufacturers**

You won't be able to buy an aluminum accordion sliding door cheaply even on sale; it's an expensive product. It is better to buy such products directly from the manufacturer. They have at their disposal designers who will correctly design the structure and production, where it will be manufactured with high quality.

It is necessary that the company has all the necessary competencies, production, transport and installation capabilities. I will personally advise all interested buyers. We will discuss all the nuances and choose the ALT BF73 accordion configuration that is most suitable for your home. Don't be afraid of the high price - comfort for many years is priceless.

Объект: КП Бариново парк.
м2

Системы: Schueco.

Объем: 360



Объект: КП Бариново парк.
м2

Системы: Schueco.

Объем: 360



Объект: КП Сады Мейндорф дом 1
680 м²

Системы: Alutech + Schueco

Объем:



Объект: Спорткомплекс Лужники
м²

Системы: Alutech структурное

Объем: 1150



Chapter 2

Why are windows made of warm aluminum 6 times warmer than cold aluminum?

Aluminum is a special glazing material with great capabilities. Even simple aluminum windows look more status than plastic ones. What can we say about premium designs! In what cases should you choose warm aluminum and what brands?

What is the difference between warm aluminum and cold aluminum?

I, Artem Volkov, am an expert in the field of aluminum structures, I have been working with aluminum since 2011.

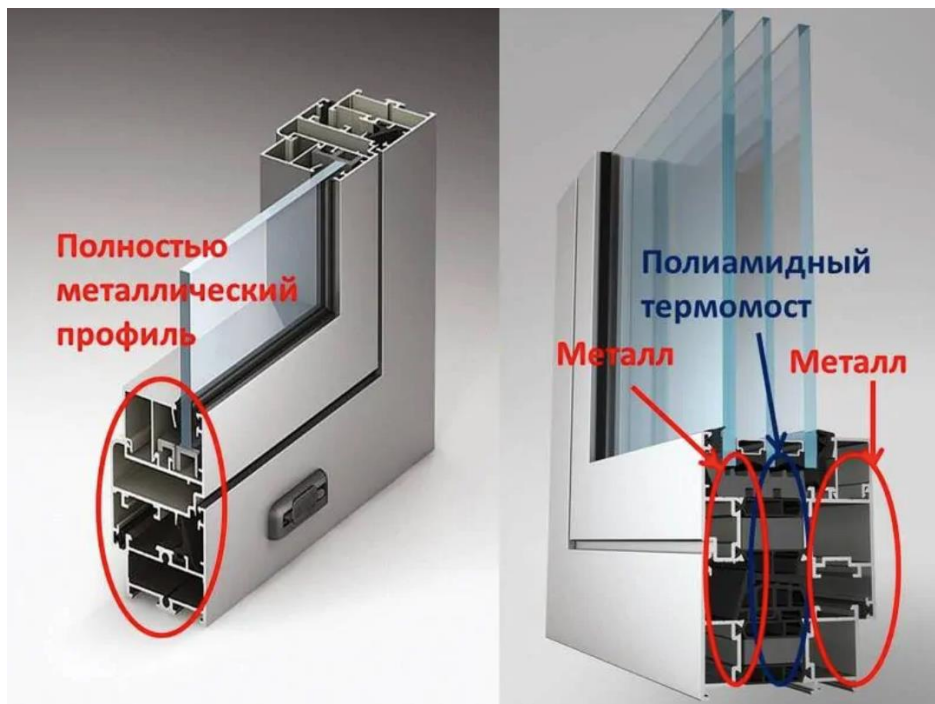


But first, a few words about the metal itself.

Aluminum is a lightweight, durable material, ideal for panoramic glazing. But it has one feature - aluminum has high thermal conductivity. Easily transfers energy

in the form of heat from a warm surface to a cold one. A window made of cold aluminum, when installed in a warm room, will freeze and become covered with ice. Cold aluminum, as the name suggests, is suitable for rooms without heating: balconies and loggias, verandas, terraces and gazebos.

The invention of warm aluminum solved the problem of thermal conductivity and freezing of aluminum windows.



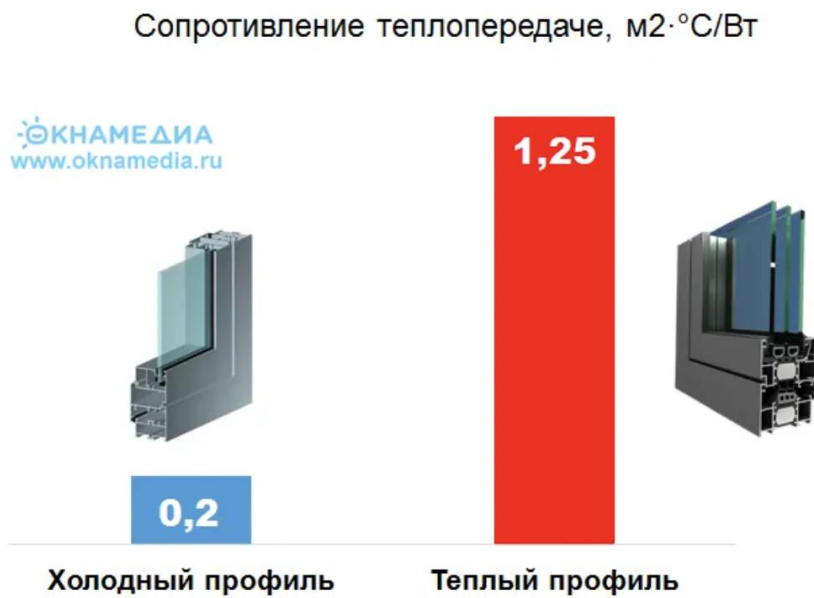
To reduce the thermal conductivity of the aluminum profile, the developers had to “tear” the metal. In warm aluminum, this gap is implemented in the form of a thermal insert.

Warm aluminum profile consists of 3 parts:

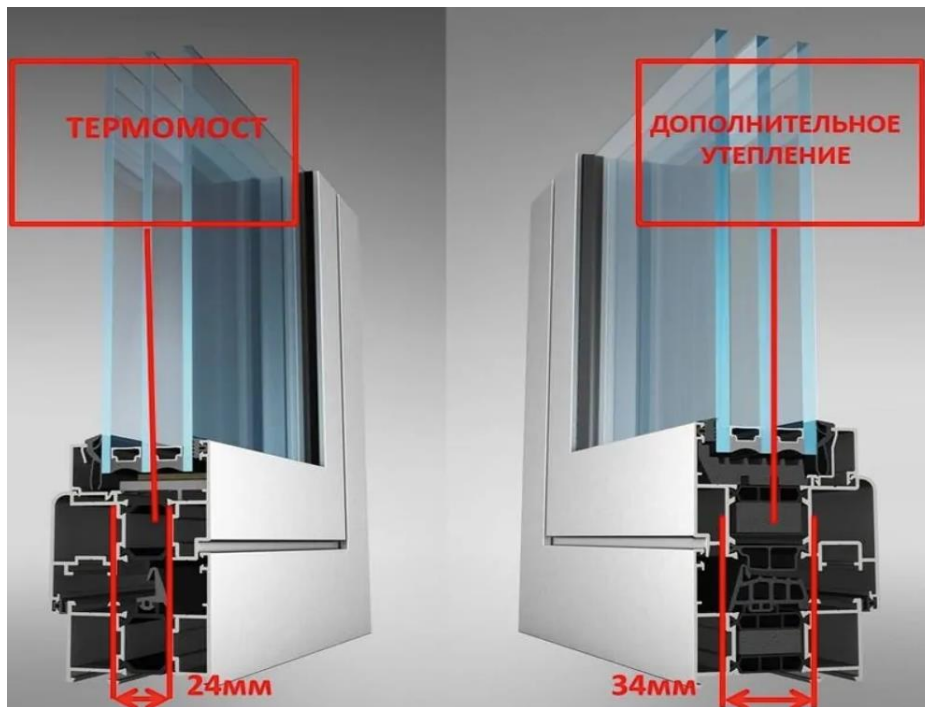
- aluminum interior;

- outer part made of aluminum;
- polyamide insert in the middle, it is called a polyamide thermal bridge

Due to metal rupture, the heat transfer resistance of warm aluminum (an indicator for assessing thermal insulation properties) increased by more than 6 times - from $0.2 \text{ m}^2 \cdot ^\circ\text{C}/\text{W}$ for a cold profile to $1.25 \text{ m}^2 \cdot ^\circ\text{C}/\text{W}$ for a warm profile.



If you fill the internal chambers of warm aluminum and a thermal bridge with foam materials, then heat loss is practically eliminated.



Warm aluminum is used in real estate with a large glazing area, which means increased static loads. Where plastic fails! Typically for panoramic glazing of country houses, city apartments, shopping and office centers, banks.

Объект: Красная пресня имний сад
м2

Системы: Alutech

Объем: 70



Pros of warm aluminum:

- The most durable material compared to plastic and wood. Allows you to make entire glass walls and facades. Warm aluminum is the supporting structure.
- Anti-corrosion. Aluminum forms an oxide film on its surface, which helps it resist corrosion. Taking into account decorative coatings, this ensures a service life of up to 80 years.
- Flight of architectural fantasy: thanks to a wide range of different systems. Window, door, mullion and transom systems will allow you to work with both flat and volumetric architectural objects.
- For any climatic conditions. It does not deform under temperature changes from -80 to +100°C and strong winds, unlike plastic.
- Possibility of painting in different colors on the inside and outside or combining types of finishes, for example, decorating with wood and painting.
- Many options for opening the doors, in addition to the standard ones - hidden, top-hung, middle-hung, center-pivot, panoramic sliding

Объект: Торговый центр Андреевской
440 м2

Системы: Krauss

Объем:



Cons of warm aluminum:

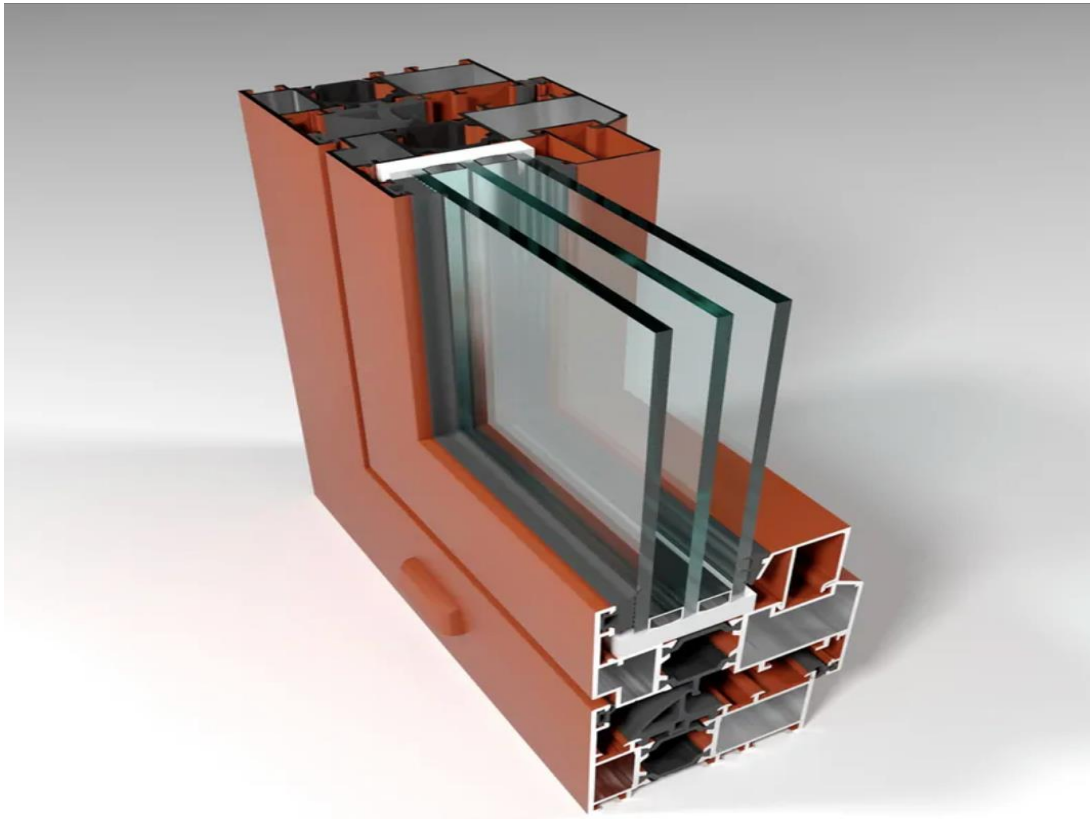
- High cost - the price of warm aluminum windows is 2-3 times higher than plastic.
- Production time is from a month.

Warm aluminum brands and prices

The range of warm aluminum profile systems is quite wide. They can be roughly divided by price categories and capabilities.

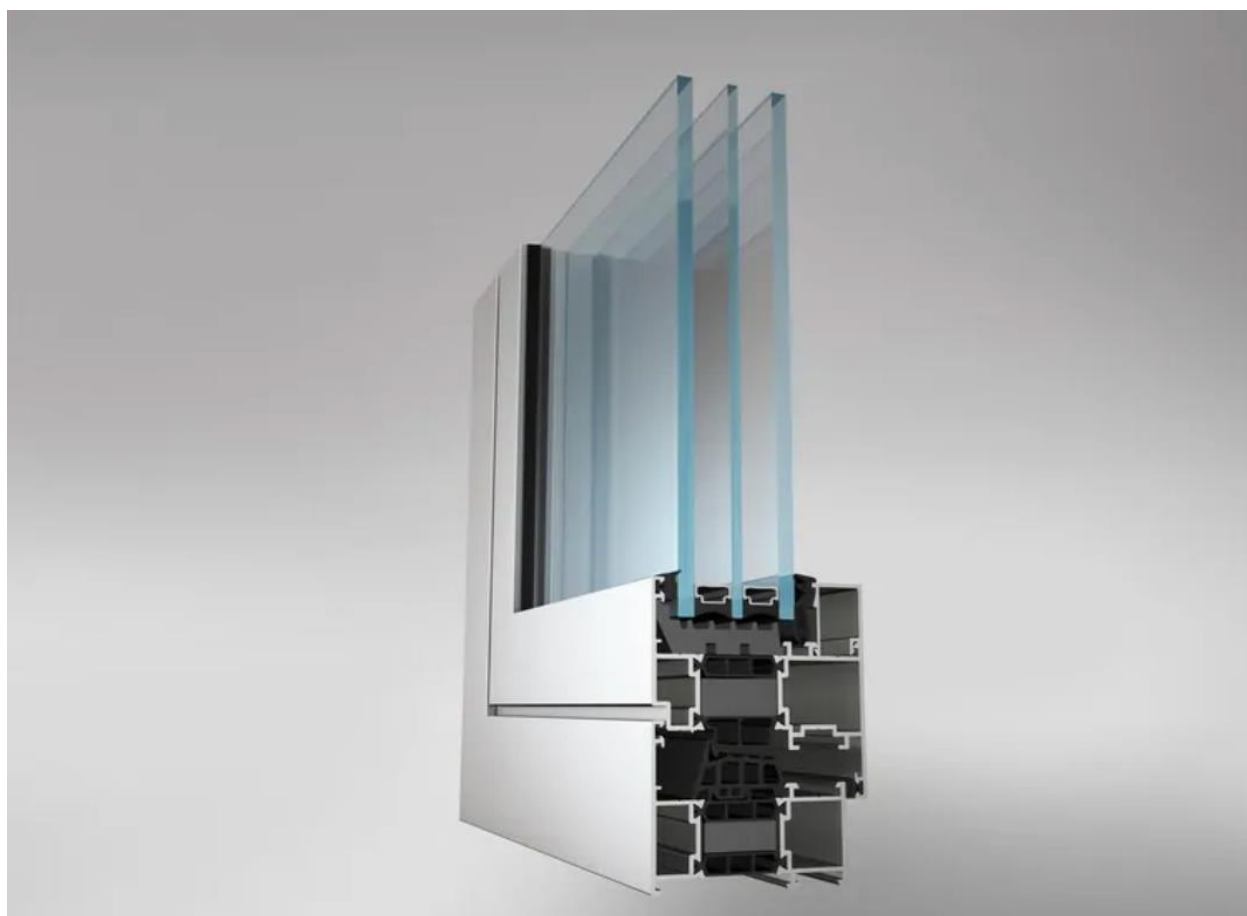
Economy segment - inexpensive systems for tender glazing and cold rooms. The low price is achieved due to limited design capabilities, a small range of profiles in the system, and low quality seals and components.

This category includes KRAUSS, SIAL and others systems



The cost of the economy segment profile is on average 20% lower than that of the middle segment.

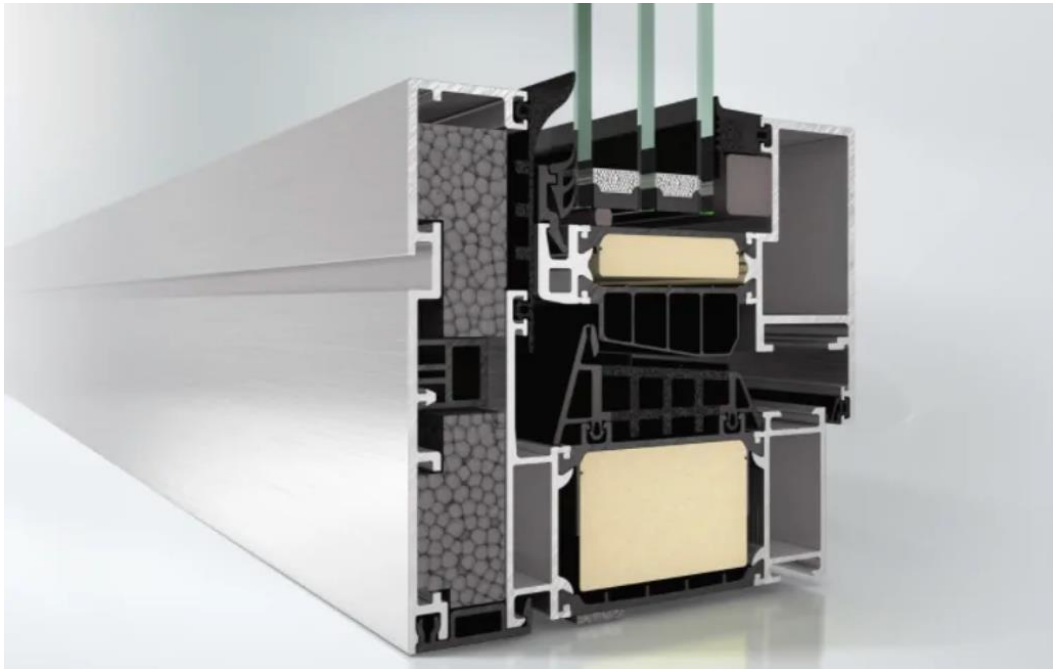
The middle segment is systems with an optimal price-quality combination. Design capabilities allow us to produce glazing for a wide range of objects - multi-storey buildings, offices, shopping centers, country cottages. Prominent representatives of this segment include Alutech, Tatprof, AGS.



Премиальный сегмент – для создания красивых и неповторимых архитектурных объектов. Огромный ассортимент профилей позволяет создавать конструкции для элитной загородной недвижимости: теплые

зимние сады, надежные входные и огромные панорамные двери, большие окна.

На рынке представлен системами Reynaers, Schüco.



The cost per square meter of warm windows in the premium segment is 40-50% higher than in the average segment.

Стоимость теплых окон из алюминиевого профиля за 1 кв.м.



What to look for when choosing a warm aluminum company?

Every year the demand for windows made of warm aluminum is slowly but surely growing. However, not all manufacturers have learned to work with products that are complex to design and manufacture. This is not plastic!

When choosing a company, you should pay attention to the presence of:

High-precision equipment for the production of high-quality aluminum structures;
A staff of qualified designers who can make calculations on the strength of the object's glazing. Select solutions that can withstand large static loads and provide the customer with the opportunity to choose for various tasks and budgets.



Special equipment for delivery, lifting and transportation of large, heavy structures around the site.

Assortment of profile systems. If, for example, only Provedal is available, then the company is unlikely to be able to make high-quality glazing from warm aluminum.

I hope my advice and work experience will help you make the right choice and find a company that makes your dreams come true.

Объект: КП Пенаты
м2

Системы: Alutech

Объем: 280



Объект: КП Жестово
м2

Системы: Alutech

Объем: 180



Объект: КСК Отрада
270 м2

Системы: Alutech + Reynaers

Объем:



Объект: КСК Отрада
270 м2

Системы: Alutech + Reynaers

Объем:



Объект: КСК Отрада
270 м2

Системы: Alutech + Reynaers

Объем:



Объект: КСК Отрада
270 м2

Системы: Alutech + Reynaers

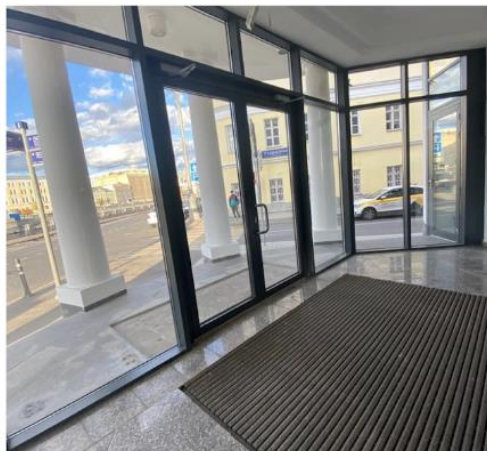
Объем:



Объект: Входная группа Арбат
35 м2

Системы: Alutech

Объем:



Объект: Гармошки 3 шт

Системы: Reynaers

Объем: 25 м2





Chapter 3

Comparing prices for aluminum windows – what to choose?

When the construction of a country house reaches the glazing stage, the questions “prices for aluminum windows”, “which windows are better to choose?” are especially relevant. and “which company should I contact?” Panoramic glazing, by definition, is not a cheap pleasure, so the desire to find the golden

the middle is quite reasonable. Today my advice concerns those who choose aluminum windows and are faced with differences in price offers from companies. Why can prices vary so much, what's the catch?

Prices for aluminum windows for a country house - compare estimates



Part of my job is to help clients make the right choices. Among my customers there are many who come by recommendation, including famous actors, showmen, bloggers and others.

Recently I was approached by a businessman (I'll call him Yuri) who was planning to glaze his country house.



By the time of our meeting, Yuri had the following questions:

- Which profile and double-glazed windows are best to choose in order to get high-quality glazing and not overpay?
- What can I offer?
- Prices for aluminum windows?
- Where to buy aluminum windows?

We immediately decided on the main points:

- I immediately rejected the option with plastic windows - glazing of this size can be done without problems only in aluminum.
- Yuri refused aluminum sliding windows for balconies, since their price was much higher than usual, and the budget for glazing exceeded the planned costs.

- We settled on façade aluminum with integrated aluminum windows and hinged doors. Yuri sent such a request to five more companies, in addition to mine, in order to be able to compare offers.

When all commercial proposals were received, the difference in cost reached 2.5 million rubles - almost three times more expensive than the cheapest one. Yuri was dumbfounded by such a sum. And no wonder. If you compare only the prices for aluminum windows, without delving into the details, then one conclusion involuntarily suggests itself: “someone wants to deceive someone.” Even the owners of such luxury houses don’t have 2.5 million lying around in their pockets. But Yuri is a businessman and a thinking person, he suspected a trick and decided to find out what was the matter?

Компания	Стоимость по КП, руб.
1	1 254 000
2	1 297 000
3	1 344 000
4	1 901 000
5	2 008 000
Компания «Окнобер»	3 683 000

What is the cost of aluminum windows?

The price of aluminum windows, like any other, includes the cost of materials (profile + double-glazed windows + fittings), manufacturing, delivery and installation.

But the production of aluminum windows also has its own nuances.

- Aluminum facade glazing requires a project that the designer is working on. He does not necessarily make a calculation of the strength of the profile; it is impossible to choose the correct profile “by eye”. It is also important to make calculations to calculate an adequate price - cheaper and thinner an aluminum profile for windows will not withstand the loads, and too powerful will unreasonably increase the price. In the project, the fastening points of the structures and their connection with the interior and exterior finishes must be worked out.
- For an accurate design and production of aluminum windows, a geodetic survey of the object is required, which also affects the cost. Without it, the aluminum facade may not be suitable for the opening - it is difficult to detect construction defects or deviations in the size and position of the openings by eye.
- The price of aluminum windows, especially panoramic windows with large double-glazed windows, necessarily includes delivery by special transport with a lift, because it will not be possible to manually remove double-glazed windows weighing hundreds of kilograms from a car.
- A separate expense item is the installation of aluminum windows. The larger and heavier the windows and glass units, the more difficult the work. To move and lift double-glazed windows on site, manipulators, robots, mini-cranes and scaffolding are required - all this is included in the final cost of the order. This is very expensive, but often people forget about this expense item when making an offer.



Detailed comparison of offers from 6 window companies

Компания/ параметр	1	2	3	4	5	Мое предложение
Профиль	Ал оконный	Ал оконный	Ал оконный + ПВХ	Ал оконный	Ал оконный + фасадный	Ал оконный + фасадный
Ширина профиля	62	62	62	62	62	72
Дополнительная теплоизоляция	Нет	Нет	Нет	Нет	Нет	Есть
Формула стеклопакета в витраже	6-20-6И	4-14-4-10-4	6-20-6И	6-22-6	10зак-20- 10заки	8MF Зак-12-6- 12-83аки
Формула стеклопакета в окнах	4-14-4-14- 4И	4-14-4-10-4	6-12-6-14-6	4-14-4-14- 4И	6зак-24- 6заки	6MF Зак-14-4- 16-63аки
Теплоизоляция	Средняя	Низкая	Низкая	Низкая	Средняя	Высокая
Звукоизоляция	Средняя	Низкая	Низкая	Низкая	Средняя	Высокая
Безопасность (прочность стекла)	Низкая	Низкая	Низкая	Низкая	Высокая	Высокая
Геодезия	Нет	Нет	Нет	Нет	Да	Да
Доставка	Да, обычная	Да, обычная	Нет	Да, обычная	Да, без учета доставки с/ пакетов	Да, с подъемником
Монтаж	Да, без материалов	Да, без материалов	Нет	Да, без материалов	Да, без материалов	Да, с материалами
Леса, подъемники	Нет	Нет	Нет	Нет	Да	Да
Цена	1 254 000	1 297 000	1 344 000	1 901 000	2 008 000	3 683 000

Upon careful examination of the commercial proposals, it was clear which of the manufacturers approached this stage thoroughly, and who made the calculation, I'm not afraid to say this at random.

I'll take a closer look at what's wrong with cheap commercial offers.

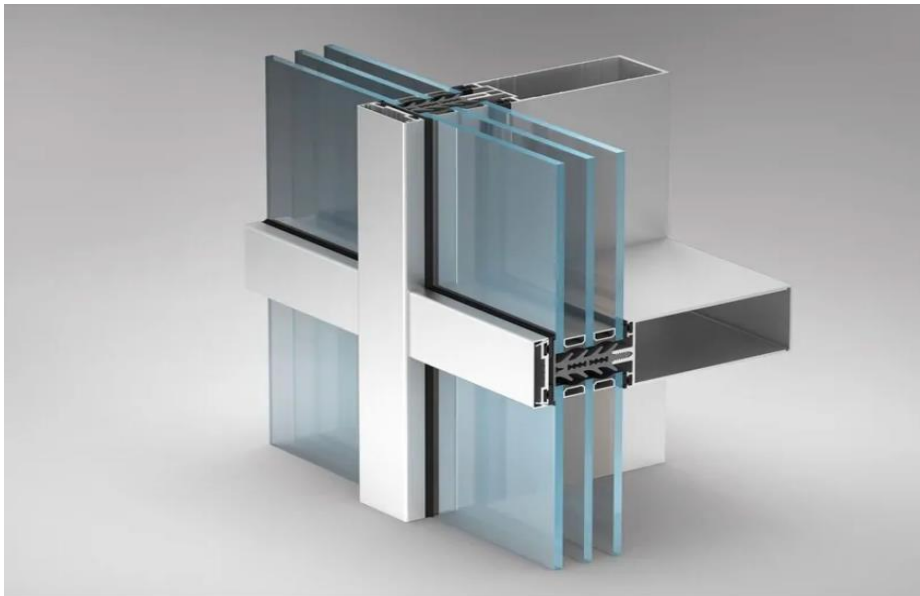
Comparing aluminum window estimates - debriefing

Let's go through all the design elements that manufacturers offer.

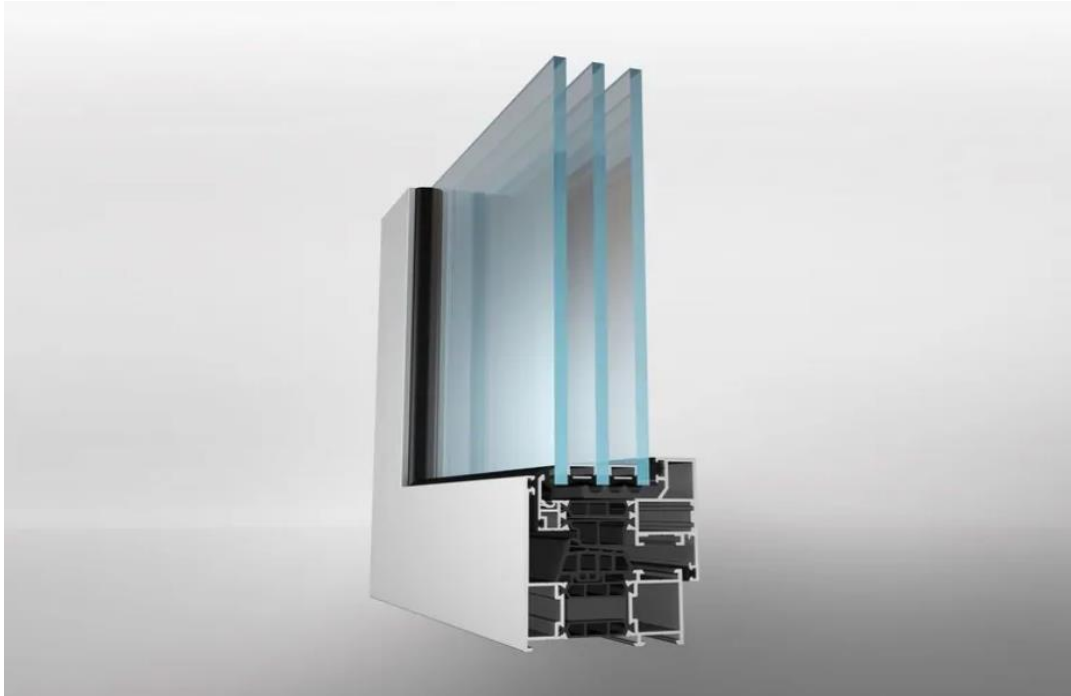
Profile systems

In warm aluminum, the choice of system options is much greater than in plastic:

- Post-transom (or façade) systems for large glazing areas. The profile does not require additional reinforcement (as in plastic reinforcement and connecting profiles), therefore the structures made from it are the most “airy” with a minimum of jumpers and maximum transparency.



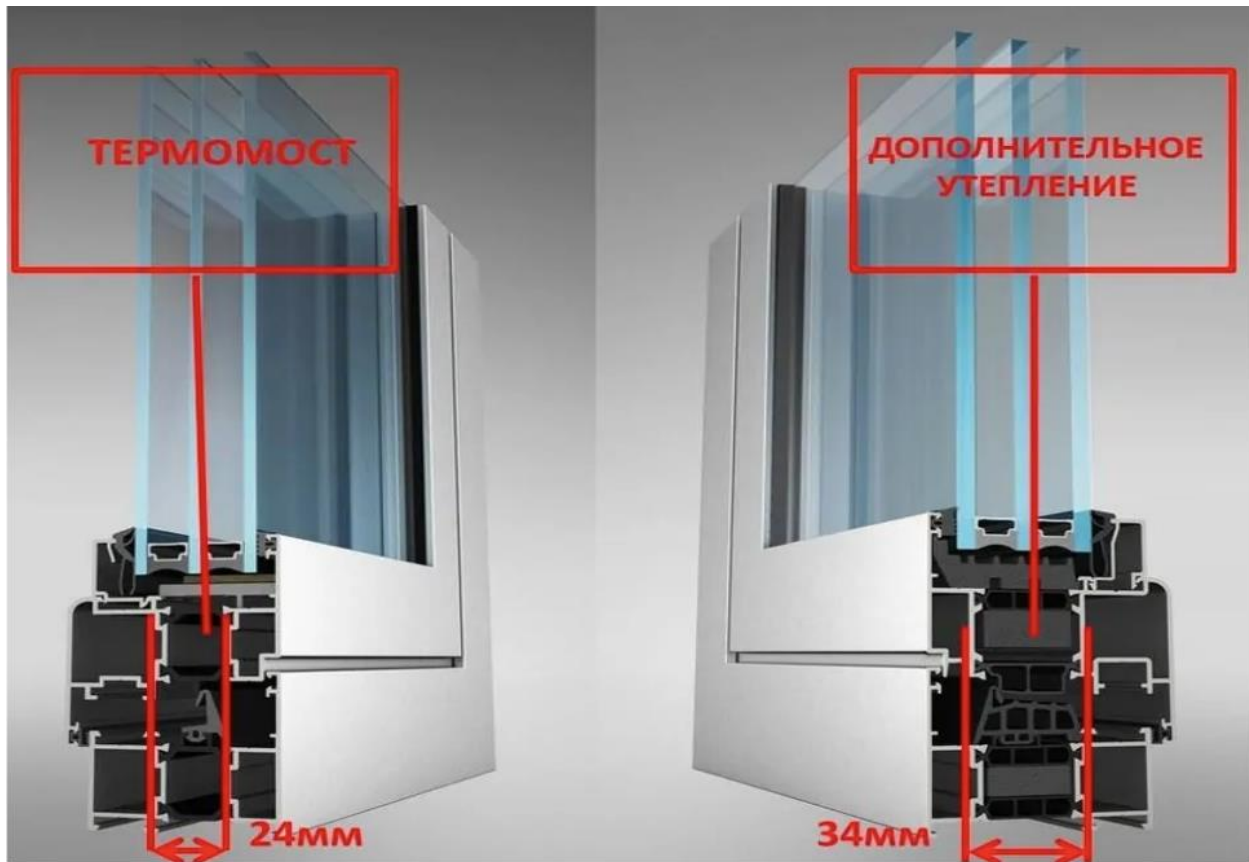
- Door and window systems with regular or hidden sashes. Hidden doors are not visible on the facade, which gives the house a modern and stylish appearance.



When using panoramic glazing, you must definitely pay attention to the thermal insulation of the profile - the ability to save heat. Thermal insulation of aluminum structures depends on the width of the thermal bridge, a special insert inside the profile that divides it into two parts and cuts off the flow of cold from the outside. The thermal bridge comes in different widths, for example, in a 62 mm wide profile the thermal bridge will be 24 mm, and in a 72 mm profile it will be 34 mm.

The width of the thermal bridge greatly affects the thermal insulation of the profile.

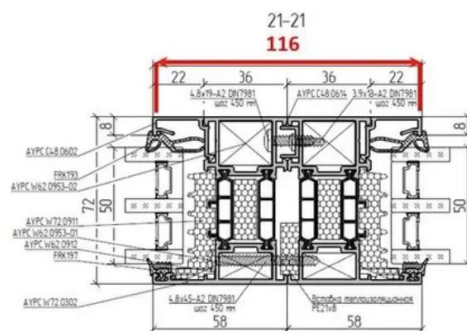
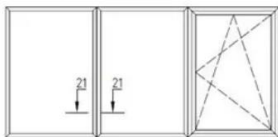
To increase thermal insulation, foam insulation is inserted inside some profiles.



What did the companies offer according to their profile?

Companies No. 1, 2 and 4 calculated all the glazing from the window profile, including the large facade. This is a technically incorrect decision - it is impossible to connect windows evenly and securely in an opening of this size.

Максимум 12



Company No. 3 made a combo offer - a large facade made of aluminum windows, and the rest is PVC. The desire to reduce the price of an expensive item is understandable, but we cannot compare prices for completely different products.

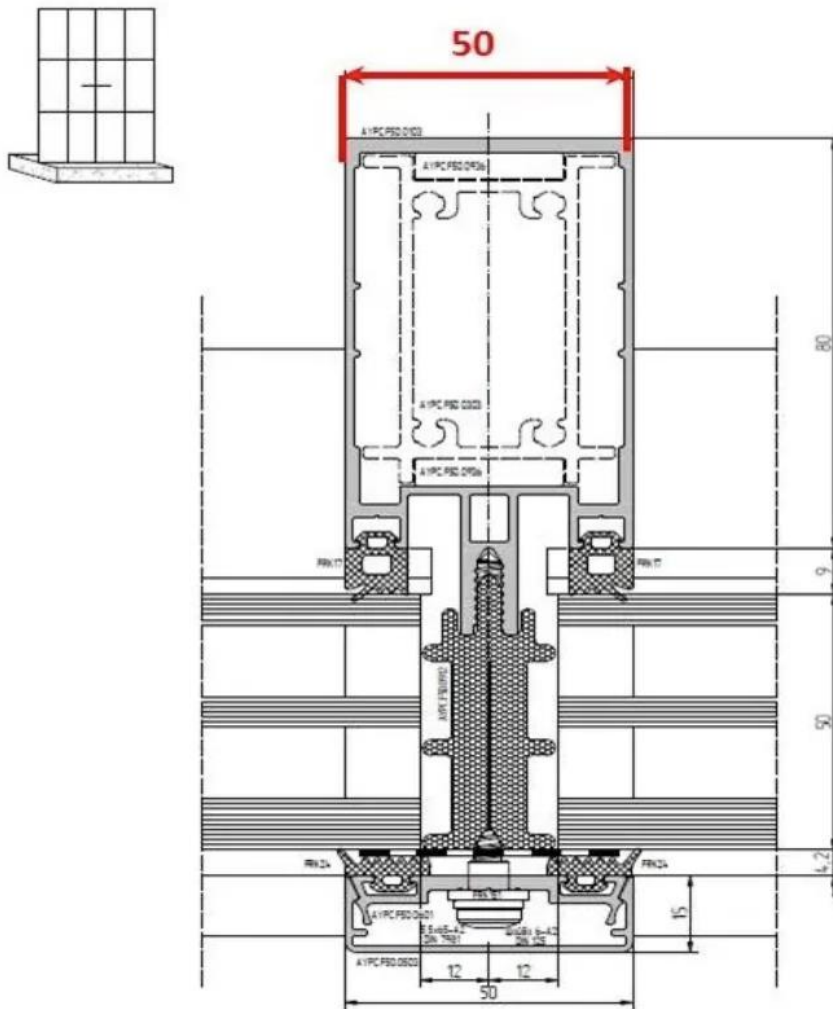
Is it possible to make a large facade from a window profile? Definitely no. Why did four companies make this choice?

I assume that the answer is simple - the manager's qualifications are not enough to calculate the aluminum facade, and the company does not have a designer or software.

Hence my first conclusion: companies No. 1-4 DO NOT have designers and making such glazing correctly will be a big problem for them, and the result is unpredictable.

Company No. 5 – the choice of profile is almost correct. It is clear that the designer evaluated the project, but still, upon request, panoramic exits to the balconies had to be from the facade profile.

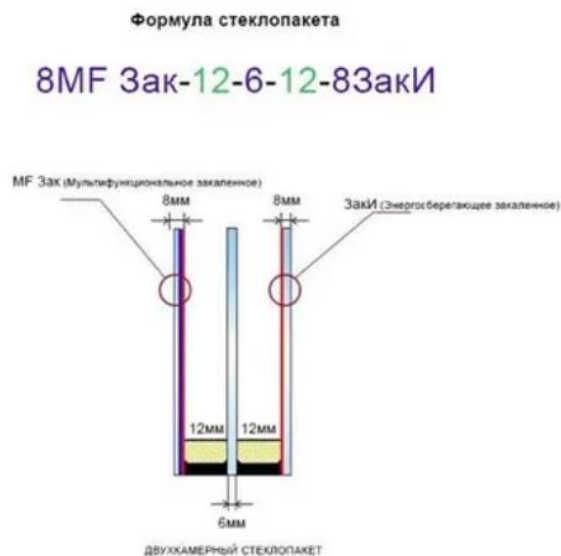
In my proposal, all glazing is made of facade aluminum, into which the entrance doors are integrated.



Double-glazed windows

In panoramic glazing, the double-glazed window occupies up to 90% of the area and heat conservation and safety largely depend on it.

The proposed double-glazed windows are worth considering in more detail.



They are attractive in terms of price, but cannot provide comfort in the home.

- Firstly, their thermal insulation properties are extremely low and with a huge glazing area, 50% of the heat will go outside. And the owner of the house will have to build a small thermal power plant nearby to heat the house. The cost of heating a house with such double-glazed windows in a couple of months will negate all the savings on the purchase.
- Secondly, with dimensions of 1700x2100 mm, glass deflection in strong winds and frosts will lead to glass sticking and destruction of double-glazed windows. Even if the glass unit does not stick together, glass less than 8 mm thick at this size will bend so that the reflection in it will be greatly distorted, as in the kingdom of crooked mirrors.

1. Double-glazed windows with the formula 4-14-4-14-4I retain heat a little better, but not enough for panoramic glazing and they will also not withstand loads.

2. Double-glazed windows with the formula 6-22-6 and 6-20-6I can withstand operational loads, but are not very good in thermal insulation.

Объект: Воронцовские пруды Зимний сад
м2

Системы: Alutech

Объем: 60



They do not provide protection against overheating in the sun and in the summer the house will be very hot, which means additional costs for air conditioning.

All the glass in them is unsafe, which breaks easily and at the same time scatters into huge sharp pieces. This is dangerous from all points of view. What if a child breaks the glass? What if there is an attacker?

The double-glazed windows 10zak-20-10zaki and 6zak-24-6zaki offered by company No. 5 are safe and will withstand wind tests, but will not retain heat in the house.

Why did I propose the glass unit formula 8MF Zak-12-6-12-8ZakI?

- They are safe, the outer and inner glass is tempered (6 times stronger than ordinary glass) - even if such glass is broken, it will crumble into small fragments without sharp edges.
- The outer glass thickness of 8mm is sufficient to resist wind loads.

- Double-glazed windows contain two energy-saving glasses, one of which is multifunctional. It is due to multifunctional glass that this double-glazed window is the most effective in terms of energy saving, because it retains heat and reduces heating and air conditioning bills. The heat transfer resistance coefficient of the selected double-glazed window with the formula 8MF Zak-12-6-12-8ZakI is $1.49 \text{ m}^2 \cdot \text{C}^\circ / \text{W}$. This parameter for 4-14-4-14-4I double-glazed windows offered by competitors is $0.75 \text{ m}^2 \cdot \text{C}^\circ / \text{W}$ - half as much.

Accessories for aluminum windows

The configuration of windows offered by all companies is approximately the same - ordinary window fittings with standard handles. The only difference is in the manufacturer of the accessories.

My calculations for aluminum windows and doors take into account the most technologically advanced, in my opinion, hidden hinges and handles with hidden sockets.



Hidden hinges, in my opinion, are the best solution for windows. This is a more aesthetic appearance of the window, not spoiled by multi-colored overlays. But the main advantage of windows with hidden hinges is their high tightness. To install them, the seal is not trimmed, as is done for installing conventional hinges; it remains solid. There is no ventilation at the installation site of hidden hinges.



Delivery and installation

Making structures, as experience shows, is only half the battle. They still need to be transported, unloaded and installed at the site without breaking or scratching anything.

I have already mentioned the difficulties of delivery and installation of large double-glazed windows. And in his proposal he took into account the cost of renting a crane and a machine with a manipulator.

The cost of delivery in competitive offers is similar to the cost of delivery of ordinary windows, without taking into account dimensions, weight and the need for special equipment. This mistake is often made by managers who are new to

intricacies of working with large-sized structures. But then it would be an unpleasant and very expensive surprise for the client!

Installation of large, heavy structures, and even at heights, requires special equipment, this is obvious. And such a volume of structures will require a lot of materials, and not only foam and fasteners. I always pay a lot of attention to this issue and choose the highest quality installation materials (warm supplied Compacfoam profile, Frankosil liquid waterproofing), I try to take everything into account to the maximum.

Why is the installation cost in my offer higher? This is why high-quality fasteners, foam and sealants are not cheap. But spoiling quality windows with economical installation is not my choice.

Объект: КП Снегири
м2

Системы: Alutech

Объем: 220



Why am I writing about this?

All these details are obvious to me, and clients who want to order aluminum windows, after I explain the importance of all these points, agree to my proposal in 95% of cases.

Open dialogue and expertise in aluminum structures attract customers. I am not silent or concealing details that could backfire in the future.

Do not rush to draw conclusions by comparing only prices in estimates for the best aluminum windows. Beautiful and high-quality panoramic glazing does not need to be rushed, but requires design and strength calculations, selection of the correct profile system, double-glazed windows and other important details.

Proper aluminum glazing is an investment that will quickly pay for itself during the operation of your home. Savings on heating and air conditioning, reliability and panoramic views will delight you for many years. For this reason, you can save up by choosing plastic or aluminum windows.

P.S. Yuri was dumbfounded by the high price, but my arguments convinced him to accept my offer. A couple of months later he returned to me for glazing. Apparently the arguments worked)

Translation of this document from Russian into English was executed **by** Alina Sedova who is competent to translate from Russian to English. I certify that this is an accurate **and** complete translation of the original document.

Signature_____

Date_____