الجمهوريـــــة الجزائريـــــة الديمقراطيـــة الشعبيـــــة

République Algérienne Démocratique et Populaire

وزارة التعليم العالي والبحث العلمي

جامعة محمد خيضر بسكرة

Ministère de l'enseignement supérieur
et de la recherche scientifique

Université Mohamed Khider Biskra

الميدان: هندسة معمارية، عمران ومهن المدينة	الشعبة: هندسة معمارية
المستوى: السنة الأولى هندسة معمارية	التخصص: هندسة معمارية

Subject: TMC 2 Course

Prepared by
Dr. Youcef Kamal

glass

Summary

glass

- 1 Definition of Glass: Glass is a solid and transparent material used in various contexts, such as the manufacturing of windows, containers, decorative objects, and even in optics for making glasses or lenses.

-2 History of Glass: The history of glass dates back several thousand years. The earliest evidence of glassmaking dates back to ancient Egypt, where glass was used to make beads and amulets. Glassmaking techniques evolved over time, with significant advancements occurring in Europe during the Middle Ages. The invention of glassblowing in the 1st century BC revolutionized glass production, enabling the creation of more intricate shapes and a wider range of products.

glass

-3 Manufacturing Process:

The manufacturing process includes melting raw materials, shaping, and annealing to reduce internal stresses.

-4 Composition:

Raw materials include vitrifiers, fluxes, stabilizers, refining agents, colorants, and opacifiers.

Each category has a specific role, such as creating the vitreous structure, melting the vitrifiers, stabilizing the glass, eliminating gases, coloring the glass, and making the glass opaque if necessary.

glass

-5 Main Sectors of the Glass Industry:

Flat Glass: Used for windows and mirrors, manufactured by processes such as drawing, rolling, and floating.

-5-1 Flat Glass Processing: Includes tempering for increased strength and laminating for safety.

Insulating Glass: Assembly of glass sheets for thermal and acoustic insulation.

Mirrors: Manufacture of mirrors.

Hollow Glass: Used in glassware, crystalware, packaging, and various technical applications.

glass

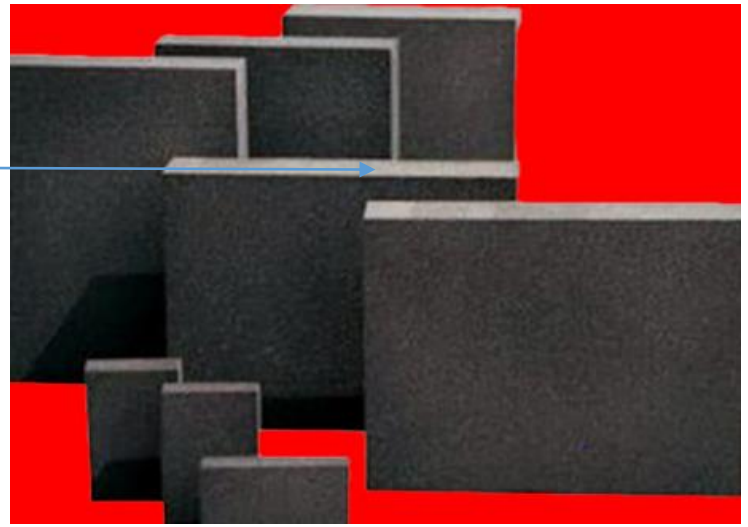
-5 Main Sectors of the Glass Industry:

-5-2 Technical Glass:

Glass Fibers: Used for textiles, reinforcing plastics, thermal and acoustic insulation.

Optical Fibers: Used in medicine and telecommunications.

Cellular Glass: Used for building thermal and acoustic insulation.



glass

-6 Properties of Glass:

Glass possesses several properties that make it useful in various fields:
Transparency: Glass allows the passage of light, making it an ideal material for windows and eyeglasses.
Hardness: Although glass is a brittle material, it is also hard and resistant to abrasion.
Thermal Insulation: Some types of glass can be used as thermal insulators, helping to reduce heat loss in buildings.
Chemical Resistance: Glass is resistant to many chemicals, making it suitable for use in corrosive environments.
Recyclability: Glass is 100% recyclable, making it an environmentally friendly material.

glass

-7 Glass in Building:

Glass is widely used in the building sector for its aesthetic and functional properties.

-7-1 Windows: Glass is used to manufacture windows that allow natural light to pass through while providing thermal and acoustic insulation.

Glass Windows: In the future, glass windows will continue to advance. Technological advancements, such as smart windows capable of automatically dimming to regulate brightness and heat, are already under development. Moreover, the focus on sustainability and energy efficiency will become increasingly crucial, driving innovation in the design and manufacturing of glass windows.

glass

-7-1 Windows:

In summary, the history of glass windows is a story of continuous evolution. From their humble beginnings in ancient Egypt to the smart windows of the future, these fundamental elements of our homes have come a long way. Today, they offer comfort, aesthetics, and practicality. Whether adorning Gothic cathedrals or outfitting modern skyscrapers, glass windows truly embody our technological and artistic progress.

The Pros and Cons of Glass Windows

The choice of windows for constructions influences their appearance, comfort, and energy efficiency. Among the alternatives, glass windows are highly favored for their contemporary aesthetics and ability to let in natural light. However, like any decision, there are both positive and negative aspects to consider; we will explore the key advantages and disadvantages of glass windows.

glass

-7-1 Windows:

The Pros and Cons of Glass Windows

- **Advantages of Glass Windows:**

Brightness and Aesthetics: Glass windows provide exceptional natural light, creating an open and pleasant atmosphere in your living space. Their modern aesthetic adds a contemporary and elegant touch to your interior.

Connection with the Outdoors: They offer views of the garden or surrounding landscape, establishing a visual connection with the outside world, which is beneficial for mental well-being and serenity.

Thermal and Acoustic Insulation: Modern models incorporate advanced insulation technologies, preserving warmth in winter and coolness in summer, while reducing external noise.

glass

- **Advantages of Glass Windows:**

Ease of Maintenance: They are relatively easy to maintain, requiring just regular cleaning to remain transparent and impeccable.

- **Disadvantages of Glass Windows:**

Security: They may be more vulnerable to intrusions and accidental breakages, but the use of safety glass such as tempered or laminated glass can mitigate these risks.

Fingerprints: They tend to easily show fingerprints and stains, requiring regular cleaning to maintain their clean appearance.

Initial Cost: Their purchase and installation costs may be higher than those of other types of windows, but this should be seen as a long-term investment due to their aesthetic and energy-saving benefits.

glass

Glass windows offer many aesthetic and functional advantages, such as brightness, modern aesthetics, thermal and acoustic insulation, as well as ease of maintenance. However, it's important to also consider the disadvantages such as security and initial cost.

If you opt for glass windows, it's recommended to choose safety glass and carefully assess your needs and budget. By collaborating with experienced professionals, such as Vitrerie-Salonaise, you can be sure to get high-quality glass windows that meet your requirements in terms of energy efficiency, style, and security.

glass

Types of Glass Windows

Glass windows play a crucial role in bringing natural light and outdoor views into our living spaces. However, there is a variety of glass window types, each with its own advantages and disadvantages. In this article, we will examine the different types of glass windows available on the market.

- **Single Glass Windows:**
  The most common and affordable.
  Composed of a single glass panel.
  Offer limited thermal and acoustic insulation.
  Suitable for buildings where energy efficiency is not a priority.
- **Double Glass Windows:**
  More efficient in terms of thermal and acoustic insulation than single windows.
  Composed of two glass panels with a layer of air or inert gas between them.
  Reduce heat loss and noise transfer, improving energy efficiency.

glass

Types of Glass Windows

- **Triple Glass Windows:**
  Offer even better insulation than double glass windows.
  Composed of three glass panels separated by layers of air or inert gas.
  Ideal for cold climates where insulation is crucial.
- **Laminated Glass Windows:**
  Popular for security reasons.
  Composed of multiple glass panels bonded by a layer of resilient plastic film.
  Reduce the risk of injury in case of breakage and provide better protection against intrusions.
- **Tinted Glass Windows:**
  Aesthetically appealing and offer protection against UV rays.
  Available in a variety of tints and patterns.
  Reduce fading of furniture and flooring.

glass

Types of Glass Windows

- **Low-Emissivity (Low-E) Glass Windows:**
  Designed to minimize heat loss.
  Coated with a thin, transparent layer that reflects heat indoors in winter and blocks it outdoors in summer.
  Improve energy efficiency, resulting in savings on heating and cooling bills.

The choice of glass window type will depend on your specific needs, budget, and the location of your home or building. Feel free to contact our team of specialized glaziers for personalized and professional advice on the type of glass windows that would best suit your situation.

glass

-7-2 Glass Facades:

Glass facades have become an iconic feature of contemporary architecture, offering transparent and luminous structures that define the modern aesthetic of buildings.
A curtain wall, on the other hand, represents a lightweight outer envelope of a building, ensuring water and air tightness without contributing to its structural stability. Typically composed of an aluminum or steel frame, it holds filling elements such as glazing or solid panels.
Beyond their aesthetic aspect, curtain walls must meet current energy efficiency standards. The choice of glazing, combined with adequate solar protection, is crucial to optimize their thermal performance. For example, certain types of glazing can maximize solar gains in winter while reducing overheating in hot regions during summer.
Glass plays a central role in the functionality of curtain walls, contributing to energy efficiency by limiting heat loss and regulating solar gains. Thus, choosing appropriate glazing can significantly influence the building's energy cost and occupants' comfort, particularly enhancing visual and acoustic comfort.

glass

Glass Facades:

Moreover, selecting reinforced or security glazing can enhance the building's safety by protecting it against intrusions and potential damages, such as impacts. Therefore, the curtain wall, through its selection of suitable glazing, contributes to ensuring the overall safety of the building.

- **Laminated and Tempered Glass:**

These types of glass offer increased safety in case of breakage, making them ideal for use in doors and shower walls. Custom tempered laminated glass represents a significant advancement in the field of glazing, offering both aesthetic and secure solutions for various applications. Before exploring its numerous advantages and enhanced safety, it is essential to understand its distinctive characteristics compared to other types of available glazing.

glass

Glass Facades:

- **Characteristics and Advantages of Custom Tempered Laminated Glass:**

With its two glass layers, custom tempered laminated glass provides enhanced safety against breakage and falls compared to simple mirrors. Its improved mechanical properties make it an anti-break-in safety glass, with shock resistance five times higher than that of regular glazing. This resistance is due to the compression of the substrate on its surface during the tempering process.

- **Different Possible Applications:**

The robustness and clear transparency of custom tempered laminated glass make it an ideal choice for custom glass balustrades, offering optimal safety. It is also recommended for buildings and homes exposed to shocks and vibrations, as a delayed-action protective glass, thanks to its laminated structure associated with tempered glass. This type of glazing is also appreciated for windows, offering increased resistance to impacts, break-in attempts, or vandalism, as well as improved sound insulation, essential in noisy urban environments. It is also suitable for glass floors, offering safety and brightness.

glass

Glass Facades:

- **Different Possible Applications:**

Tempered laminated glass shower walls combine functionality, moisture and shock resistance, and modern elegance in bathrooms. In addition to these applications, its versatility allows it to adapt to other architectural projects such as interior partitions and doors, ensuring both privacy and passage of light. Its ability to retain glass shards in case of breakage makes it a safe choice for environments where occupant safety is paramount. Thus, custom tempered laminated glass represents a preferred solution, combining durability, performance, and aesthetics, for a variety of applications beyond guardrails, meeting the growing demand for bright, secure, and aesthetically pleasing living spaces.

glass

Glass Facades:

- **Thermal Insulation:**

Thermal insulation glazing helps reduce heat loss in buildings, thus improving their energy efficiency. Choosing high-performance thermal windows is crucial for optimizing the energy efficiency of constructions.
These windows offer superior thermal insulation thanks to their high-performance glazing. They are often equipped with double or triple glazing, with inert gases such as argon or krypton between the glass panes to reduce heat transmission.

Low-emissivity double glazing, also known as low-e glazing, features a thin, transparent layer of metal oxides on one side of the glass panes, which retains heat. This improvement in the thermal transmission coefficient significantly reduces heat loss, up to 20 to 30% compared to standard double glazing, and even up to 80% compared to single glazing. Indeed, their insulating capacity is two or three times higher than that of traditional double glazing.

glass

Glass Facades:

- **Thermal Insulation:**

While low-e double glazing may be more expensive than traditional double glazing, it allows for significant heating cost savings. In general, this investment pays off in just two years. Similarly, triple glazing offers even higher thermal and acoustic performance, but its cost is also higher. However, this investment may be justified for facades particularly exposed to extreme weather conditions.