



Pattern Glass Applications – Toughening, Colourful & Sustainable Partitions

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GOPAL GLASS GROUP



Gopal Glass group is a 48 year old company and the largest Patterned (Figured) and Wired glass manufacturer in India with 400 tons/day production capacity, most efficient plant & is having 60 % national market share. Gobind Glass is manufacturing solar glass with 150 tons day

Products:

Patterned Glass

Patterned (Figured) glass is a kind of decorative translucent flat glass with embossed patterns on one or both surfaces. With the special property of decoration, figured glass can fully allow the light to pass through and on the other hand, can limit or prevent clear view effectively. It is used in partitions, windows, decorative glazing, furniture, bathrooms, etc.

Wired Glass

The wire mesh is passed through the molten glass coming out from the throat of furnace while other processes are same that of manufacturing Figured glass. It is used in industrial, institutional and residential buildings for safety purpose.

Gopal Glass is pioneer in manufacturing 2 mm Anti Glair Rolled Glass which is widely used in photo framing.



How Patterned Glass Is Made

Patterned glass is produced on a rolling line rather than the float-glass process used for clear flat glass. Molten glass flows out of the furnace and is passed between two rollers — the top roller is engraved with the negative of the desired pattern, and as the glass ribbon passes beneath it, the design is embossed into one or both surfaces while the glass is still soft enough to take the impression. The ribbon then passes through a long annealing lehr, a temperature-controlled tunnel that cools the glass gradually to relieve internal stresses before it is cut to sheet size.

Because the pattern is rolled in rather than added afterward, it becomes a permanent part of the glass surface rather than a coating or applied film, which is one reason patterned glass tends to be more durable and easier to maintain than surface-etched or frosted alternatives over a building's lifetime. Roller design is a significant part of a manufacturer's product differentiation: pattern depth, repeat size, and motif determine how much light diffuses through the glass and how effectively it obscures a direct line of sight, and a wide catalogue of registered pattern designs is one of the more valuable intangible assets a patterned-glass manufacturer builds up over time.



Wired glass - A related product manufactured on similar rolling lines, wired glass is produced by feeding a steel wire mesh into the glass ribbon as it emerges from the furnace, so the mesh becomes embedded through the thickness of the sheet. While its use has narrowed considerably with the rise of float glass, laminated safety glass, and modern fire-rated glazing systems, it retains a niche role in older-style fire door vision panels and applications requiring basic impact containment, where the embedded wire holds broken fragments together.

Colour can be introduced at two different stages of this process. Body-tinted patterned glass is coloured by adding metal-oxide colourants directly to the raw batch before melting, so the colour runs through the full thickness of the sheet. Alternatively, colour can be applied afterward through coatings, ceramic frit, or coloured interlayers introduced at the lamination stage — an approach that gives manufacturers a wider and more easily changed colour palette without altering the base melting recipe.



Mechanical properties

Property	Annealed Float	Annealed Pattern	Toughened Pattern
Density (kg/m ³)	~2500	~2500	~2500
Young's Modulus (GPa)	70–72	70–72	70–72
Poisson Ratio	0.22	0.22	0.22
Flexural Strength (MPa)	45	35–45*	120–200
Surface Compression (MPa)	0	0	90–150



Property	Typical Range
Visible Light Transmission	78–88%
Haze	60–95%
Solar Transmittance	70–82%
UV Transmission	<25% below ~380 nm

Optical properties (3–4 mm clear patterned glass)

Values vary significantly with texture.



Applications of Patterned Glass

The defining characteristic of patterned glass — controlled transparency — makes it suitable across a wide spread of uses. Applications are generally grouped by the balance they strike between light transmission, privacy, and decorative effect:

Interior Partitions and Room Dividers

This is the largest and fastest-growing application segment. In offices, patterned glass partitions divide open-plan floors into meeting rooms, cabins, and breakout areas without blocking borrowed daylight the way a solid wall would. In hospitals and clinics, patterned glass is used for consultation-room and ward screening where visual privacy is a regulatory or clinical requirement. In schools and colleges, it is used for corridor and classroom glazing that lets facilities staff supervise spaces visually while maintaining a sense of enclosure for occupants.





Windows and Decorative Glazing

On facades, patterned glass is typically used as an accent rather than a primary glazing material — as spandrel panels, feature strips, or infill panels alongside clear vision glass — to add texture and break the monotony of large glazed elevations. In residential settings it is common in stairwell windows, entrance doors, and any opening where daylight is wanted but a direct view in or out is not.

Bathrooms and Wet Areas

Shower enclosures, bathroom windows, and partition screens between wet and dry zones are among the oldest and most established uses of patterned glass, since obscured visibility is often a basic functional requirement in these spaces rather than a purely aesthetic choice.









Furniture and Fit-Out

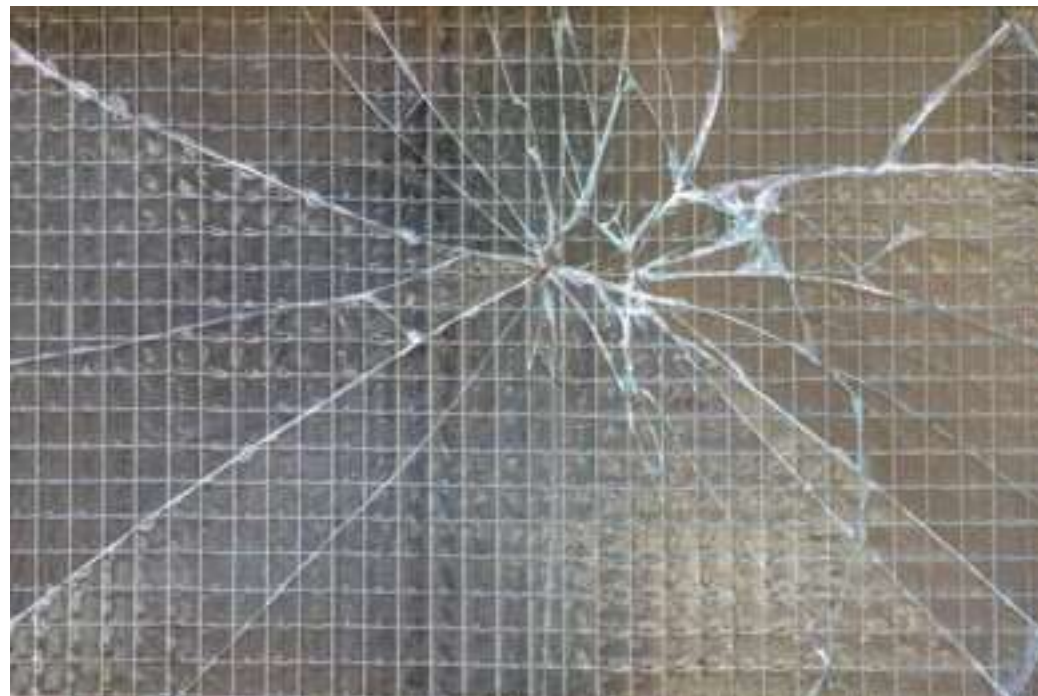
Patterned glass is used in cabinet doors, wardrobe shutters, tabletops, and display shelving, where the texture adds visual interest to furniture while the glass remains easy to wipe clean, unlike fabric or textured laminate finishes.

Institutional and Industrial Glazing

Factory skylights, stairwell enclosures, and machine guarding are common industrial uses, where the textured surface has the practical side benefit of making surface dust and light scratching far less visible over the life of the installation than it would be on polished clear glass.











Toughening: Turning Decorative Glass into Safety Glass

On its own, annealed patterned glass shares the same brittleness as ordinary flat glass — it fractures into sharp, jagged shards under impact, which is unsuitable for most modern building-safety codes once the glass is used above a certain size or height, or in a door, partition, or balustrade. Toughening, more precisely called thermal tempering, addresses this.

The Tempering Process

Cut-to-size, edge-worked panels are loaded into a tempering furnace and heated to around 620–650°C — close to the glass's softening point — and then rapidly cooled (quenched) using arrays of high-pressure air jets directed at both faces simultaneously. Because the outer surfaces cool and contract faster than the still-hot core, the finished panel ends up with the outer layers locked in permanent compression and the inner core in tension. This residual stress pattern is what gives toughened glass its two defining safety properties: it typically withstands three to five times the mechanical and thermal stress of annealed glass of the same thickness, and if it is eventually broken, the stored energy causes it to fracture across its whole area into small, relatively blunt granular pieces instead of long dangerous shards.



Adapting the Process for Patterned Surfaces

Patterned glass presents a more uneven surface profile than flat float glass, with peaks and valleys that can be a few tenths of a millimetre to a couple of millimetres deep depending on the design. This unevenness affects how heat is absorbed and how uniformly the quenching air jets make contact with the surface. Furnace loading patterns, dwell time, and jet pressure are calibrated to the specific pattern depth being processed, since insufficient or uneven quenching can leave a panel under-toughened in places or introduce optical distortion, or in the worst case cause breakage during the process itself. This is one reason toughening patterned glass reliably at scale is considered more specialised than tempering plain float glass, and why processors with dedicated experience in figured glass are often preferred for this segment.



Colourful and Sustainable Partitions

Two trends are reshaping demand in the partition segment specifically: colour, and sustainability — both in how the glass is made and in how it performs once installed.

Design and Colour

Coloured and tinted patterned glass has expanded the material's role from a purely functional divider into a design feature in its own right. Partitions in soft ambers, greens, greys, blues, and bronze tones are increasingly specified to zone open-plan offices, retail interiors, and hospitality spaces, replacing solid drywall or plain clear glass with a surface that carries both branding and mood. Combined with an expanding catalogue of embossed pattern designs — from fine linear textures to bolder geometric or organic motifs — colour gives architects and interior designers a large palette of light-transmission and privacy levels to choose from within a single project, often mixing two or three colourways across different zones of the same floor.

Manufacturers have also been pairing coloured patterned glass with lamination, sandwiching a coloured PVB or resin interlayer between two glass panels. This approach can achieve a wider and more precisely controlled colour range than body-tinting, and has the added benefit of producing a laminated safety glass build-up — useful where a project specification calls for both colour and a higher level of impact retention than toughened glass alone provides.





Sustainability in Use

Once installed, patterned glass partitions contribute to sustainable building performance in a more direct way: by maximising daylight penetration deeper into a floor plate compared with solid partition walls, they reduce a building's dependence on artificial lighting during working hours, which is one of the larger contributors to a commercial building's operating energy use. Toughened glass's mechanical durability also extends the working life of an interior fit-out relative to materials that need more frequent refurbishment or replacement, reducing the embodied carbon associated with repeated renovation cycles. Laminated-and-toughened partition build-ups additionally support acoustic separation between zones, helping a single product meet daylighting, safety, and occupant-comfort goals at the same time — an increasingly common requirement in green-building rating frameworks such as IGBC and LEED, which award credits for daylighting and low-VOC, long-life interior materials.



Market Context

India has a long-established patterned and wired glass manufacturing base, with production capacity concentrated among a small number of specialised rolling-line operators rather than the larger number of players active in float glass. Demand has historically tracked the broader construction and real-estate cycle, but the partition segment in particular has benefited structurally from the shift toward open-plan commercial interiors, the growth of organised retail and hospitality fit-outs, and rising specification of safety glazing in building codes. Export demand, particularly for decorative patterns not widely produced elsewhere, has also become a meaningful part of some manufacturers' order books.

Outlook

As Indian and global construction moves toward greener, more daylight-driven buildings, patterned glass sits at a useful intersection of decoration, safety, and sustainability. Continued innovation in pattern design and colour, wider adoption of heat-soak-tested toughened glass for safety-critical applications, and cleaner furnace and batch technology on the manufacturing side are all likely to keep expanding the material's role beyond its traditional bathroom and institutional base into mainstream commercial interiors, facades, and partitions..



Sustainability

Carbon Footprint
Life Cycle Analysis
Embodied Carbon
Recycling
Circular economy

Future Research

AI Inspection
Laser Texturing
Smart Pattern Glass
Nano Structured Surfaces
Low Carbon Glass
Industry–CGCRI Collaboration on above topics



THANK YOU