Technical Information

Vertical Glazing with PLEXIGLAS®

Instructions for Installing PLEXIGLAS®

Contents

Preliminary note

This brochure describes vertical applications for solid sheets according to our table of contents. Additionally, our leaflet entitled "Fabricating Tips for PLEXIGLAS® solid sheets" (Ref. No. 311-5) informs you on the preparatory work and skilful execution of glazing work with PLEXIGLAS®. Apart from the recommendations given in this brochure, for which we assume no legal responsibility, you must observe any standards or codes of practice which apply to the use of our products.

Products and Properties

PLEXIGLAS® is a break-resistant acrylic material of supreme weather resistance. We guarantee that clear, transparent PLEXIGLAS® will show no yellowing and will retain a high level of light transmission for 30 years.

PLEXIGLAS® is highly light-transmitting (92 % in Clear at 3 mm thickness) and very light in weight; a sheet 3 mm thick and measuring one meter square weighs only just 3.6 kg. PLEXIGLAS® can be cold-curved, but certain minimum radii have to be observed (s. Instructions for Installing, Ref.-No. 311-8, P. 39). A particularly break-resistant material during handling, fabricating, installation and in use is impact-modified PLEXIGLAS® Resist[1].

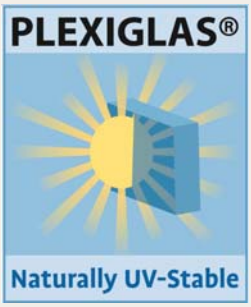
Typical applications are

- Windows, doors, gates and indoor partitions
- Guards
- Noise-control barriers
- Screens and wind-control barriers
- Facade cover
- Vertical glazing

[1] Europ Patent 776 931

Natural protection against yellowing and light loss

Together with light and warmth, the sun also emits UV radiation. The dangerous portion of this UV light that reaches the earth is growing as a result of the hole in the ozone layer. PLEXIGLAS® consists of extremely strong, UV-stable molecular chains through and through. Special NATURALLY UV-STABLE technology stabilizes PLEXIGLAS® completely from within. This means the entire sheet is protected, not just the surface, providing maximum protection against UV radiation, yellowing and light loss.



Design hints

a) Changes in length and allowance for expansion

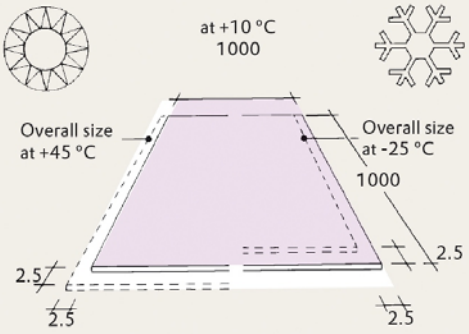
PLEXIGLAS® sheets expand due to heat and/or moisture and contract in a cold and/or dry climate. Therefore, the fastening systems must be able to yield, so as to allow the sheets to move. The sheet lengths are to be measured in such a way that the sheets cannot slip out of the glazing sections when they are cold. On the other hand, the material must be able to expand unhindered when it is warm in order to rule out damage due to buckling. Assuming an ambient temperature of 10 °C on installation, the sheets will contract up to 2.5 mm per meter in the cold (Fig. 1). For their expansion due to heat **and** moisture a **general allowance** should be made of:

5 mm/m for PLEXIGLAS® and
6 mm/m for PLEXIGLAS® Resist

which is the distance to the "clear cross-section" of the frame.

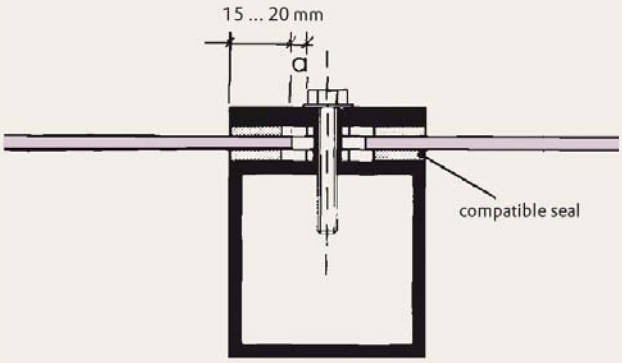
In comparison with basic grades of PLEXIGLAS®, PLEXIGLAS® Resist sheets, as a result of their increased break resistance, are less rigid and more prone to expand in heat and moisture.

Fig. 1: Heat expansion and cold contraction



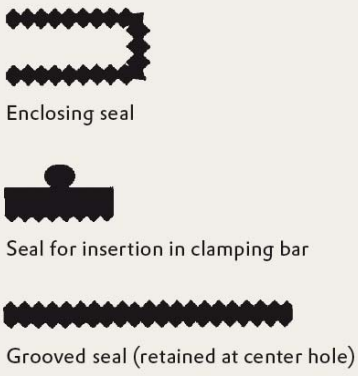
Because of the possible change in length, the clamping depth of the glazing should be between 15 and 20 mm. In addition, there is to be a clearance "a" for expansion and compensation for building tolerance. The value "a" depends on the sheet size and corresponds to one half of the general expansion allowance calculated as above (Fig. 2).

Fig. 2: Example of a metal supporting member



b) Seal sections

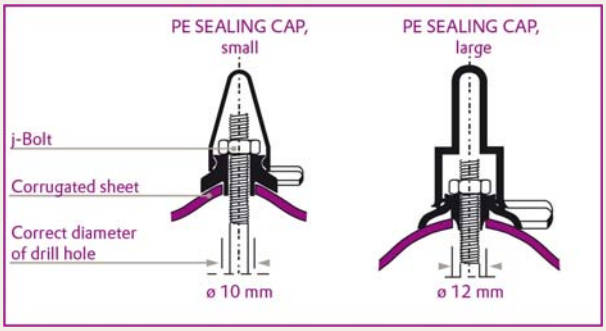
Fig. 3: Different seal sections

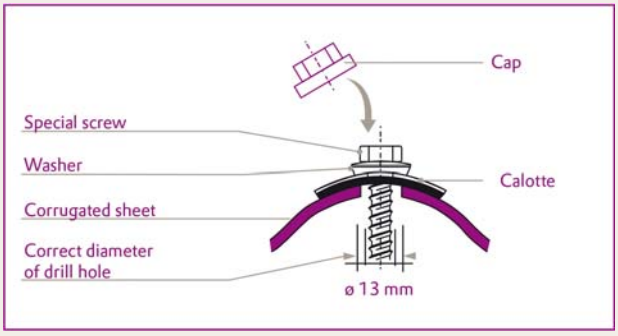


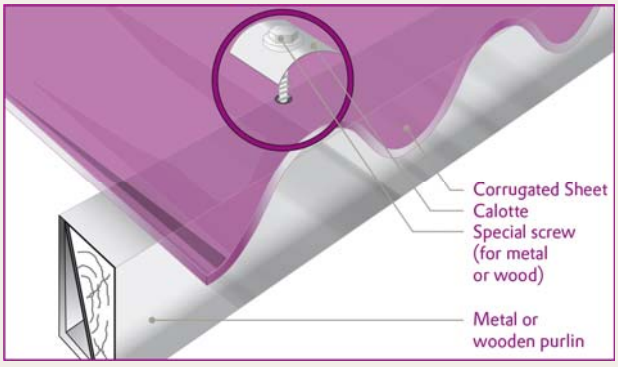
The sealing sections used determine the watertightness of glazing with PLEXIGLAS®. Particularly important is the material they are made of. PLEXIGLAS® is sensitive to certain sealants, which should therefore always be tested for **compatibility**.

Normally suitable:
- EPDM
- polychloroprene
- PE, PTFE, PA
- silicone rubber

Nearly always harmful:
- plasticized PVC
- polysulphides
- PUR foams





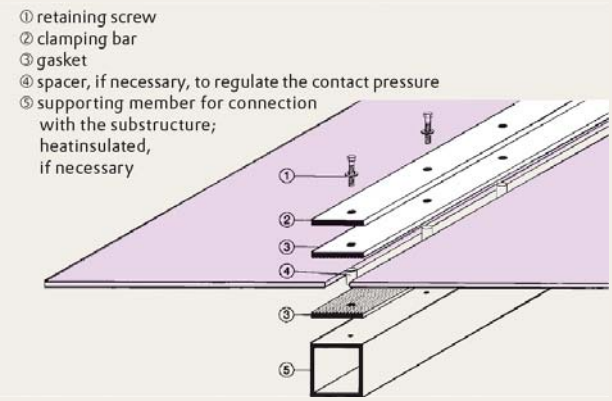


c) Fastening methods

Structural components made of PLEXIGLAS® can be fastened pointwise or linearly.
Pointwise fastening is suitable for
- small glazing areas,
- irregularly curved glazing,
- inherently stable items, e.g. domed roof lights or thick sheets,
- corrugated sheets

Fig. 10 and 11 show drill holes and screwed connections designed for use with PLEXIGLAS®.

Fig. 4: **Linear fastening** usually takes the form of "patent glazing". This consists of the following items:



As a general principle, linear fastening is to be preferred since the load conditions are more favorable in this case and thinner sheets can be used as a result. The allowance to be made for expansion is again 5 mm/m for PLEXIGLAS® (PLEXIGLAS® Resist: 6 mm/m).

The linear fastening method is particularly suitable for
- large glazing areas,
- regularly curved glazing,
- cold-curved glazing elements,
- multi-skin sheets.

In the case of linear fastening, **the change in length is balanced by the sheets sliding in between the seals or by flexing of the seals**. This edge fastening system has to be watertight without being so rigid as to prevent the sheets from moving. Linear fastening has the advantage

that the forces resulting from the loads (dead weight, wind, snow) are evenly distributed over the supports.

d) Contact pressure

An important aspect with all constructions is the contact pressure, i.e. the force produced by the screw and transmitted to the elastic sealant via the fastening elements. This pressure must be calculated in such a way that adequate tightness is achieved while the sheets can still slide in response to linear thermal expansion. If the contact pressure is too high, this may be detrimental to the system. Since the pressure affects above all the weakest link in the fastening system, the elastic seal becomes excessively compressed, whereupon the clamped PLEXIGLAS® sheets can no longer move properly. Depending on the construction and the materials and sealants used for the fastening system, upsetting deformation and buckling occur or the seals are displaced. Thus it may happen that the movement of the sheets causes the seals to slip out of the frames and lose their tightening function. Apart from that, excessively compressed seals quickly lose their elasticity and thereby also their sealing function. For regulating the contact pressure the use of e.g. a spacer sleeve is recommended.

The applications

a) Glazing

The required thickness of PLEXIGLAS® sheets depends on

- the envisaged use
- the rebate depth (= clamping depth plus half allowance for expansion; see “(a) Changes in length and allowance for expansion”)
- the sheet size
- the snow and wind loads to be assumed for a given location (e.g. to DIN 1055).

Assambly details

Our pictures show typical examples of assembly details which suit the special character of PLEXIGLAS® sheets (principles only).

Fig. 5: Optimized clamping system

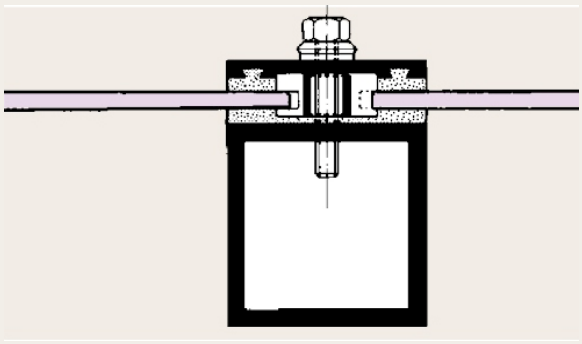


Fig. 6: Too high clamping pressure

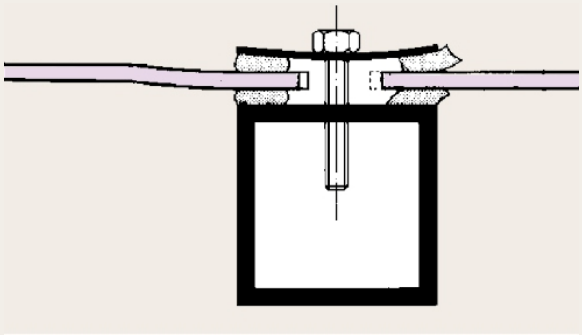
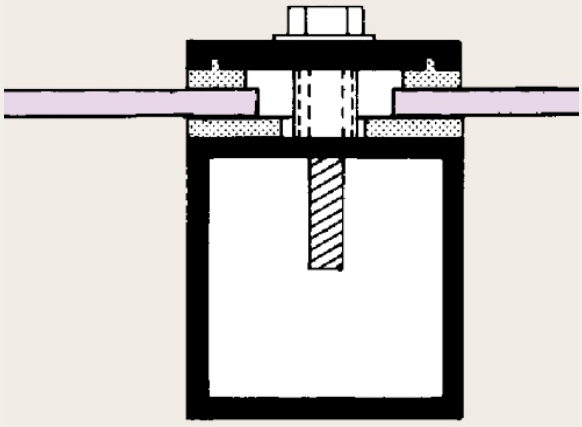


Fig. 7: Spacer sleeve
(also for edge protection)



b) Protection from falling

Being available in many different colors and thickness, sheets of PLEXIGLAS® are often used as infill panels for balcony guards and balustrades. PLEXIGLAS® sheets are, moreover, popular for their ten surface textures in thickness up to 8 mm.

PLEXIGLAS® Resist sheets are installed where extreme impact strength is required in addition to safety for the users.
Despite this advantage we recommend choosing somewhat thicker infill panels made of PLEXIGLAS® Resist than of PLEXIGLAS®, so as to make up for the educed stiffness of the impact resistant material.
The sheet thicknesses recommended here after were determined in a pendulum impact test, striking the infill panel mounted in a sturdy frame with twin tires. The frame has a major influence on the stability of the structure; hence the need to have it tested under standard conditions by a competent institute.
Balcony guards and staircase balustrades are subject to building inspectorate regulations, which have to be observed. A balcony infill panel, for example, must be at least 900 mm high.
Grades of PLEXIGLAS® are "normally flammable", B 2 to DIN 4102 (Class 3 and TP(b) to British Standards) and as such approved in Germany for use in balcony guards on buildings up to two stories high.
PLEXIGLAS® sheets with one textured surface are best installed with the texture facing inwards; on the one hand because of the visual effect and on the other hand to make good use of the self-cleaning effect by rain on the outside.

1)Clamping all around

Many users choose standard metal sections for clamping the sheets (Fig. 30). This is possible with PLEXIGLAS® as long as due allowance is made for the change in length and **only sealants compatible with PMMA** are used.
Commercially available installation kits as shown in figure "Clamping on two sides" are also suitable
The lower channel sections should be provided with drain holes.
At a maximum sheet length of 1,500 mm and a height of not more than 800 mm, the minimum required sheet thickness is 6 mm and the minimum rebate depth for the channel sections 20 mm.

2) Clamping on two sides

As regards expansion, sealing, sheet size etc., the recommendations are the same as under (1).
Given a maximum sheet length of 1,500 mm, for example, and a maximum height of 800 mm, the required sheet thickness is 8 mm and the rebate depth of the clamping sections at least 20 mm.
Cut sheet edges that remain visible should be smoothed with a scraper or chamfered with a file.

3) Fastening at banisters

If the sheets are to be installed between banisters without any further support, the necessary stiffness must be ensured by using sheets of adequate thickness between reasonably spaced banisters.

Banister spacing in m	PLEXIGLAS® GS/XT Sheet thickness in mm
1 ... 1.2	8
1.2 ... 1.5	10
over 1.5	min. 12

Thus, if the banister spacing exceeds 1.2 m, thicker sheets (outside the textured sheet range) have to be used, PLEXIGLAS® XT and PLEXIGLAS® GS sheets are available in thickness of up to 25 mm.
Since screwed connection of acrylic is only the second-best installation method (after clamping), care must be taken to proceed according to the figure.
Drill holes must be much larger in diameter than the screw thread.
Protect the sheet wall inside the drill hole with a compatible sleeve (e.g. polyethylene) around the thread.
Use large washers with the screws and compatible elastic seals (e.g. EPDM).
Tighten the screws only to such an extent that the sheets are still able to move.

4) Pointwise fastening

Where metal tongues are used, the sheets are held in position by bolts and nuts, which either clamp or penetrate them according to the figure. Since the sheet will transmit the generated stress irregularly to the supporting balustrade, it is essential to observe every single detail mentioned under „Fastening to banisters“ (text and figure). This solution is particularly elegant if the sheet edges are polished.

c) Cover sheet

Preparing the substrate

Substrate and installation surface

The right substrate

The following substrates and carrier materials are particularly suitable for installing PLEXIGLAS®:

- waterproof gypsum wallboard
- coated* moisture-resistant chipboard
- coated* MDF panels
- firmly installed mirror tiles
- lath and plaster partition treated with adhesion promoter
- stone (brick, sand-lime brick) or concrete wall painted with latex paint

*coated at the points where the adhesive tape is applied. The coated surfaces must be completely dry and cured.

Preparing the substrate

Please bear the following in mind when applying the bonding method:

- If tiled surfaces are to be covered, remove any loose tiles.
- Fill any spaces with tiles or tile fragments and tile adhesive.
- There must be no parts on the wall that protrude.
- Countersunk head screws (e.g., used to install wall sheets) must be flush with the wall.
- Substrates must be clean, dry, flat, dust- and grease-free, solid and load-bearing.
- Chemical interaction with the substrate must be excluded.

d) Wall installation

PLEXIGLAS® Hi-Gloss

Brilliant Solutions for Noble Applications

Clear, high-gloss PLEXIGLAS® is coextruded over a color-effect layer in just one operation, adding a glossy touch to all your applications.

The outstanding optical and mechanical properties of PLEXIGLAS® make it an excellent choice for designing stylish walls and interiors.

PLEXIGLAS® is mounted as sheet material on a wall or supporting structure and serves as a “curtain type” design element.

The material is installed invisibly according to the key and lock principle. This means the sheets can be dismantled at any time. They are fastened to the wall or supporting structure by means of double-sided mirror tape combined with neutrally crosslinking silicone. The ideal method of fastening PLEXIGLAS® indoors is invisible suspension.

The following brochure tells you how this works and provides a great deal more information on working with PLEXIGLAS®:

332-3 Machining and Installation of PLEXIGLAS® Hi-Gloss.

Fig. 8: Clamping all around

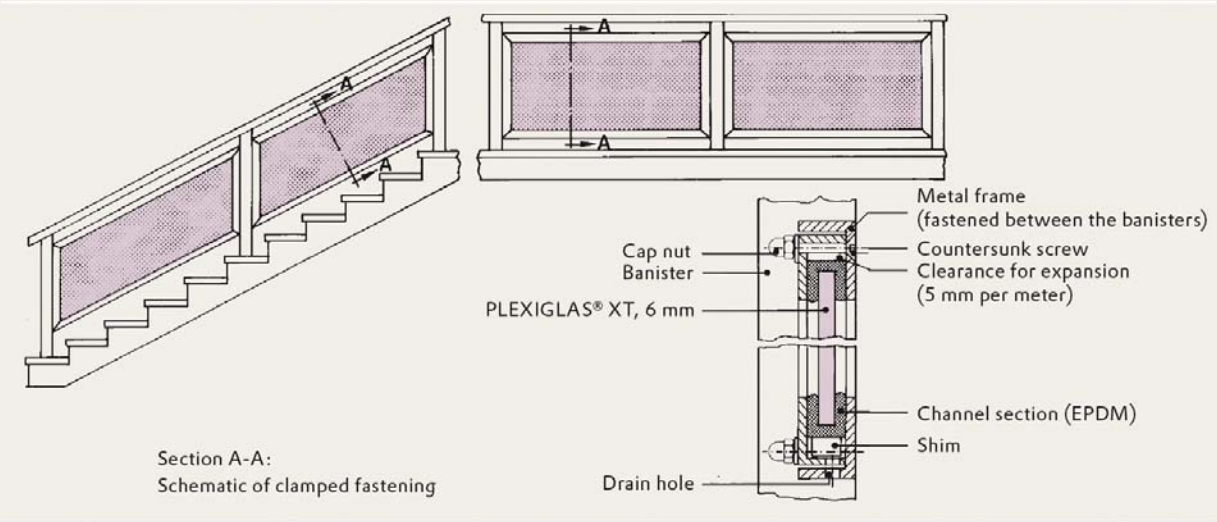


Fig. 9: Clamping on two sides

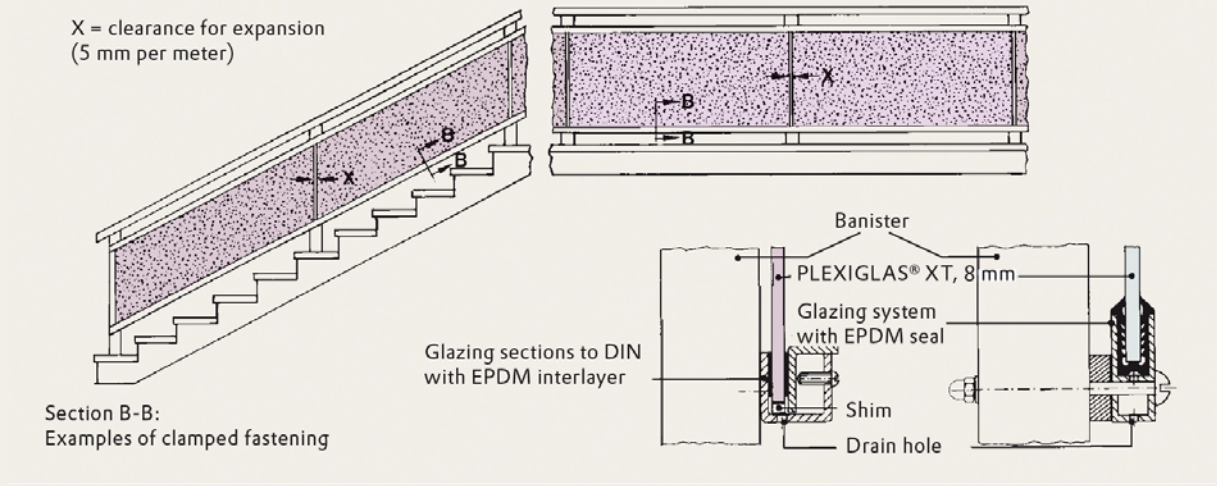


Fig. 10: Fastening at banisters

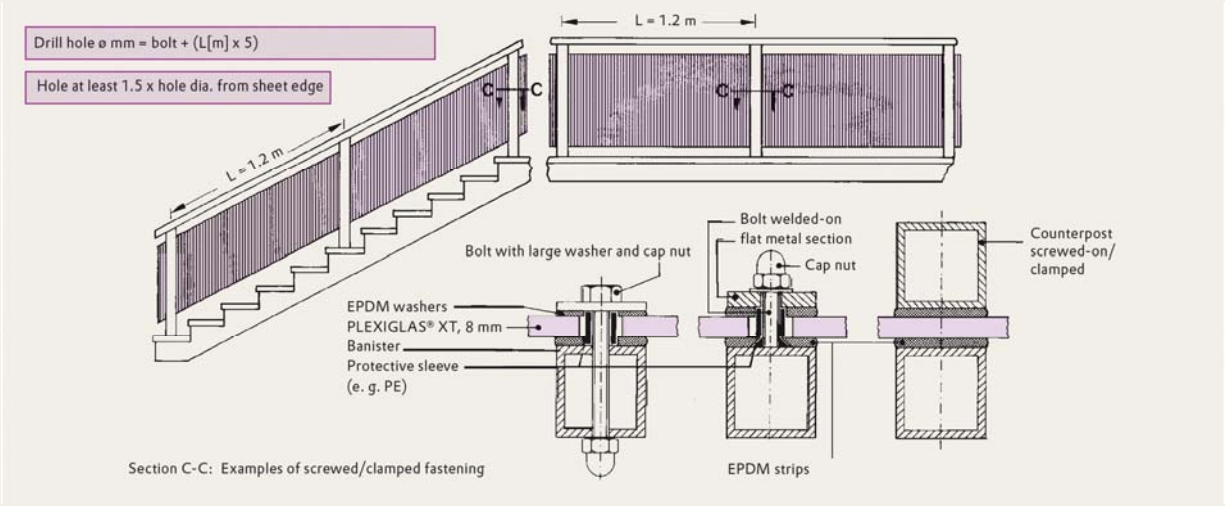
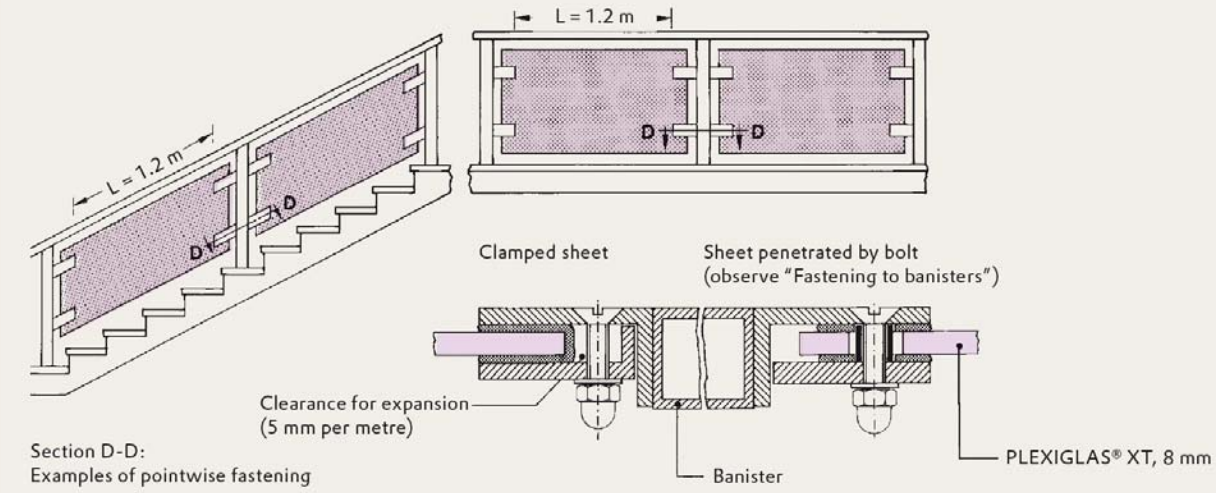
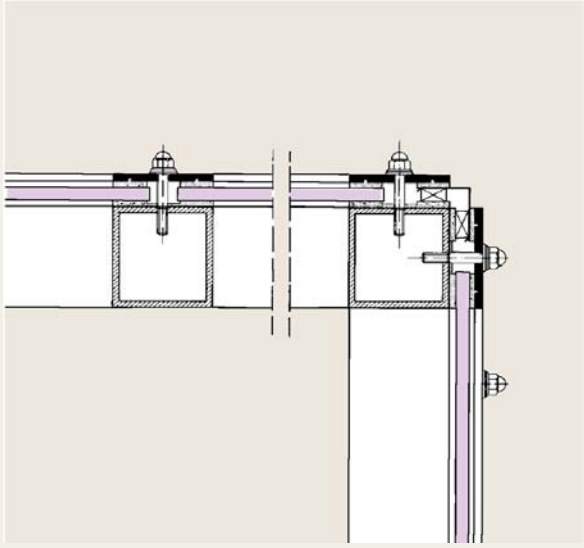


Fig. 11: Pointwise fastening



Vertical glazing, corner connection

- Contact pressure determined by threaded rod and cap nut
- Angle section covers corner



Disposal/Recycling/Fire rating

The various environmental impacts of PLEXIGLAS® from production to recycling, including its effect on reducing greenhouse gases due to its longevity, were determined and confirmed in this life cycle assessment (eco-balance) in accordance with DIN ISO 14040ff. Apart from its durability, PLEXIGLAS® is also convincing in terms of recycling. It can be broken down into its original chemical constituents or directly and completely recycled.

We ensure that our products are environmentally compatible and contain no harmful substances. Thus, for example, PLEXIGLAS® is free from hormone-related substances and heavy metals. It contains neither asbestos nor formaldehyde, CFCs, PCB, PCT nor plasticizers. In addition, PLEXIGLAS® complies with the relevant directives for use in toys and packaging.

PLEXIGLAS® is distinguished by its lack of toxicity in the event of a fire. It does not produce any acutely toxic smoke gases or dense smoke, which means that escape and rescue routes remain clearly visible.

Cleaning

Dirt finds it hard to adhere to the perfectly smooth surface of PLEXIGLAS®. Dusty surfaces can be cleaned with water to which some washing-up liquid has been added, using a soft, non-linting cloth or sponge. Do not rub dry. Microfiber cloths dampened with water have a good and practically smearfree cleaning effect. In the event of heavier soiling, particularly with grease, benzene-free petroleum ether or isopropyl alcohol can be used to clean PLEXIGLAS ®.

Suitable cleaning agents are:

- lukewarm water with a little washing-up liquid
- vinegar essence diluted with water
- isopropyl alcohol (2-propanol)
- pure petroleum ether
- soft, damp viscose sponge
- soft, damp non-linting cloth
- sponge cloth
- chamois leather
- glove-lining fabric
- cotton tea-towel
- shower squeegee with soft rubber lip
- damp microfiber cloth for the final touch

Abrasive cleaning agents should never be used for cleaning acrylic.

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