

# Façade mounting

## General information



When mounting photovoltaic plants to building façades, specific regulations must be observed as defined by the glass manufacturers. As well as the usual warranty risks such as roof leakage or damage to modules, there is an additional risk of injury to people in the event of substandard fastening or through the selection of inappropriate modules.

The following recommendations should help the planner / installer to mitigate such risks and to ensure a secure and professional design.

### 1 General recommendations for mounting on building façades

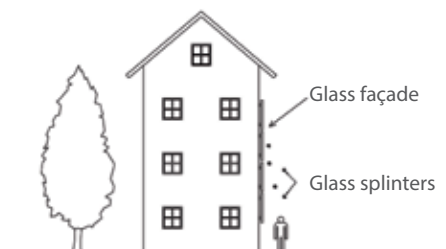
Due to the current lack of specific standards in the photovoltaic sector, all standards and approval conditions pertaining to construction must be observed when implementing projects in this area. The designated photovoltaic establishment is obligated, as experts in the field, to inform the end customers of all potential risks and of required approvals, and must observe the valid standards as "State of the Art".

As a matter of course, each module assembly mounted to a building façade should be treated as an individual case, particularly where the deployment surface is a public building and where the area beneath the façade assembly is generally accessible.

### 2 Mounting variations

There are two fundamental variations:

The term **vertical glazing** is used if the photovoltaic module is mounted parallel to the wall, either directly on or with a specific clearance to the surface.



**Overhead glazing** is the term used if modules are mounted at a certain angle, resembling a form of "canopy structure" where the area beneath the modules is publicly accessible.



In both cases, irrespective of whether damage is caused by negligence (tension in glass, incorrect mounting, thermal tension, etc.) or whether a module is damaged through external influences, there is a fundamental risk of glass shards falling from the assembly and causing injury to passers-by.

### 3 Specific recommendations

Vertical or overhead glazing is only approved in publicly accessible areas if the possibility of injury due to falling glass fragments can be ruled out in the event of damage to a laminate glass part (including a PV module).

- Vertical or overhead glazing is deployed using appropriate composite glass materials (generally VSG and ESG materials): The modules are protected against shattering by a laminated film which can hold glass together for a period of time after breakage.
- Overhead laminate glass systems may have a generic type approval which offers authorization for deployment in specific areas.
- In addition to the materials deployed, the fastening method and the module arrangement generally have a great influence on utilization in the vertical or overhead positions.
- **As a general principle, photovoltaic modules are not approved for mounting in an overhead assembly.** This applies to both framed and unframed modules. PV modules are also designed, technically, in glass-film compound format, but are nevertheless not approved for deployment as an overhead laminate assembly. More information on this subject can be obtained from the respective manufacturer.
- In the event that PV modules are proposed as a façade or overhead solution, a specific method of fastening is generally imposed (e.g. a linear arrangement of laminated modules).
- It is possible for a system with a non-approved design for application in overhead assemblies to **be approved, as an "exceptional case"** for deployment in certain projects. Approval for exceptional deployment generally requires a positive destructive test on several components (in the case of PV modules this may be more expensive than for glass components). Several test specimens are damaged and the laminate film must prove capable of holding fragments together over a specific period, guaranteeing that no dangerous shards can break free and cause injury.

#### 4 Examples of application



In the examples shown here, the restrictions outlined under point 1. must still be observed. However, approvals issued on a case by case basis, or restricted access to areas below façade assemblies may well suffice for the mounting of an assembly. It should be noted that, in all cases, the installing company is responsible for providing the customer with written notification of all potential risks.

## 5 Additional information

### Standards

- DIN EN 410, Glas im Bauwesen - Bestimmung der lichttechnischen und strahlungsphysikalischen Kenngrößen von Verglasungen (Glass in building - Determination of luminous and solar characteristics of glazing); Version: 1998-12
- DIN 1249-10, Flachglas im Bauwesen; Chemische und physikalische Eigenschaften (Flat glass in building; chemical and physical properties); Version: 1990-08
- DIN 1249-11, Flachglas im Bauwesen; Glaskanten; Begriff, Kantenformen und Ausführung; (Flat glass in building; glass edges, definition of terms, edging and execution); Version: 1986-09
- DIN 1249-12, Flachglas im Bauwesen, Einscheiben-Sicherheitsglas; (Flat glass in building, Single-layer safety glass); Version 1990-02
- DIN 1259-1, Glas - Part 1: Begriffe für Glasarten und Glasgruppen; (Terms for glass types and glass groups); Version: 2001-09
- DIN 1259-2, Glas - Teil 2; (Glass - Part 2): Begriffe für Glaserzeugnisse; (Terms for glass products); Version: 2001-09
- DIN EN 14449, Glas im Bauwesen; (Glass in building); Verbundglas und Verbund-Sicherheitsglas; (Laminated glass and laminated safety glass): Konformitätsbewertung/ Produktnorm, Deutsche Fassung (Conformity assessment/ Product standard, German version) EN 14449: 2005 European standard, version July 2005
- DIN 52337, Prüfverfahren für Flachglas im Bauwesen; Pendelschlagversuche (Test procedures for flat glass in building; pendulum impact test); Version: 1985-09
- DIN 52338, Test procedures for flat glass in building; ball drop test for laminated glass Version: 1985-09
- DIN 52349, Structure after fracture of glass used in buildings. Version 1977
- DIN EN ISO Laminated safety glass film properties (tear resistance and elongation at rupture)

### Directives and regulations

- Draft of technical regulations for the dimensioning and design of glazing with punctiform glazing supports (Entwurf der Technischen Regeln für die Bemessung und Ausführung punktförmig gelagerter Verglasungen, eTRPV.)
- DIBt TRAV: Technische Regeln für die Verwendung von linienförmig gelagerten Verglasungen; (Technical regulations for the use of linear arranged glazing);
- GUV 56.3 Mehr Sicherheit bei Glasbruch; (More safety in the event of glass breakage);

### Literature:

- Glasfibel.(Publ.: Bundesverband des deutschen Flachglas-Großhandels, 1983)
- Wörner, J-D.; Schneider, J. (Authors): Abschlussbericht zur experimentellen und rechnerischen Bestimmung der dynamischen Belastung von Verglasungen durch weichen Stoß; TU Darmstadt/German Institute for Building Technology; 2000
- Charlier, H.: Bauaufsichtliche Anforderungen an Glaskonstruktionen, Der Prüfenieur Nr.11 (1997), S.44-54
- Sedlacek, G/Blank, K./Laufs, W/Güsgen, J.: Glas im konstruktiven Ingenieurbau, Bauingenieur Praxis, Ernst & Sohn, 1.Auflage, Berlin, 1999

**The above selection of literature should be used as fundamental reference material relating to glass construction.**