FULLY GLAZED INTERIOR PARTITIONS

Choice of glass for interior partitions

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1. Introduction
This guide provides an overview of important issues involved in the selection of interior non-load-bearing fully glazed vertical partitions.
Aim:
– to provide guidelines based on the provisions given in the Danish Building Regulations 2008 (BR08) and standards;
– to describe methods and solution principles;
– to provide guidelines for entrepreneurs and consultants.

A satisfactorily installed fully glazed partition depends upon the selection of the appropriate glass and associated materials, correct construction principles, as well as the correct installation.

2. Applications
This guide applies exclusively to examples of non-load-bearing fully glazed partitions without fire resistance properties.

3. Construction requirements
3.1 Documentation
BR08 Provision 4.3.1
“Glazed partitions, glazed surfaces and glazed constructions must be satisfactorily constructed and dimensioned with regard to safety and injury to persons.”

BR08 Regulation 4.3.1
“This provision covers design and construction of glass in roofs, walls, facades, doors, windows, ceilings and with guard functions, etc.
Glazed partitions in walls and glazed doors and glazed partitions next to doors should be clearly marked or otherwise protected.
Marking must be at a suitable height for the visually impaired persons.
If safety guards are used with glazed partitions for protection against injury, they must be made in accordance with the provisions in chapter 3.
See also DS DS/INF 119 “Glass in buildings – Guidelines for the selection and use of safety glass”

If no other statistical calculation or other method has not been used to show that the thickness of the glass used is satisfactory, it is recommended that glass thicknesses comply with the figures in the tables. The tables show the maximum span relative to the type of glass used, and loads shown in table 1 and in section 3.5.

In the BR08 DS/INF119:2007 guideline, it is stated in “Materials and areas of applications” section that in the case of different floor levels, the following safety specification applies to all structures: “Special attention must be made in the case of different floor levels where glass has a guard function, and where individuals are at risk of falling if the glass partition is broken.
This applies to large differences in levels (more 0.5 m) between the floor on either side of a glazed partition, a window that reaches the floor, a glazed screen and glazed balustrades in a stairways, etc.
In the above example, safety glass must be used which ensures there is no risk
of cutting, if the glass is broken on impact, the broken pieces remain in the pane, so that the risk of a complete collapse of the glass pane on collision is minimised. This is ensured by using laminated glass that ensures that the pane remains intact after the glass has been broken.”

3.2 Product requirements

Glass types
Tempered and laminated glass must comply with DS/EN12150 and DS/EN14449 respectively. For more information refer to Glasindustrien (Danish Glass Association) data sheets: “Thermally tempered glass” and “Laminated glass” at www.glasindustrien.org

Glass edges
As a minimum, all horizontal edges shall be ground and vertical edges shall be polished. This also applies to concealed edges. For further information see Glasindustrien (Danish Glass Association) data sheet “Thermally tempered glass” and The Danish Building Research Institute (SBi) guidelines 215:2008 “Dimensioning of glass in the building envelope”.

Tolerances
Measurement deviations are acceptable and fastenings and joints must allow for these. Tolerances for tempered and laminated glass are found in S/EN12150 and DS/EN14449 respectively.

Glass thickness and weight
Glass thicknesses are nominal and shown in mm. The total thickness of laminated glass is shown with one decimal point. Glass (tempered or laminated) weighs 2.5 kg / m² per mm of glass thickness.

3.3 Installation requirements

- The guidelines provided by the supplier of glass, profiles and furniture must be carefully followed when installing the glass
- It must be ensured that glass and metal do not come into contact with each other throughout the entire lifetime of the construction
- Load bearing blocks must be made from a stable and non-absorbent material, e.g. synthetic material with hardness rated at 70–95 shore “A”
- Glass that has an integrated U rail at the ceiling, adjacent structural elements and floor should be finished with sealant or sealing strips in accordance with the supplier’s guidelines
- The glass overlap in the profiles should be minimum 12 mm
- The glass tolerances must be allowed for in the furniture and profiles
- Building subsidence: Tolerances and movements in the building structure must not affect non-load-bearing fully glazed partitions
- Door dimensioning and installation of doors should be assessed individually in accordance with the doorsupplier’s guidelines
3.4 Working environment conditions

Technical and mechanical aids should be used whenever possible, when handling glass elements and other materials; this applies to both vertical and horizontal, and installation. Provision for this should be made in the project design and planning stage.

The Work Environment Council for Building and Construction in Denmark provides relevant information about working environment conditions within the civil engineering and building industry at www.bar-ba.dk

Project Supervisor
The project supervisor must make sure that the project documentation ensures, that:

- the construction and maintenance complies with the Danish Health and Safety at Work Act
- there is sufficient space and opportunity to use technical and mechanical aids

So that:

- deadlines are accurately planned, described and incorporated into the project
- access, transport and assembly areas are established and dimensioned in accordance with the task
- glass is positioned appropriately, in relation to the installation site, and to access and transport areas for technical mechanical aids

The glass supplier

The glass supplier shall always prepare guidelines that contain:

- weight specifications
- any special lifting instructions, labelling of individual glass sections with glass dimensions, glass number, thickness, etc. in order to provide a unique identification of glass sections at the construction site

The contractor

Based on the project material and his own experience, the contractor must plan the work and correctly organise health and safety matters, including a workplace assessment (APV) for the specific project.
3.5 Load and calculation conditions

**Loads**
Non-load-bearing fully-glazed partitions shall only be exposed to the horizontal imposed load, 1,200 mm above the floor level in accordance with the guidelines in the Eurocode or interior wind loads, as shown in table 1.

Wind load is determined in accordance with the Eurocode for suburban areas or urban areas, based on a building height of max. 10 m, as shown in table 1.

The wind load and the glass must be individually assessed in cases where the fully glazed partitions are exposed to greater wind loads than those shown in table 1, including partitions exposed to wind load from prominent openings.

**Width of Glass**
It is recommended that glass widths should be a minimum of 0.9-1.0 m. Narrower widths can be where there is no difference in floor levels and where the exposure, of the partitions, to stress is minimal. In both cases individual assessment should be made.

In addition to the horizontal imposed load, the horizontal wind load on the glass should be assessed. It is assumed that the two loads do not act simultaneously.

**Categories of use**
The letters in the “Category” column of table 1 comply with DS/EN1991-1-1:2007 “Categories of use”:

- **A** Areas for domestic and residential activities. Rooms in residential buildings and houses, bedrooms and wards in hospitals, bedrooms in hotels and hostels, kitchens and toilets.
- **B** Office areas
- **C** Areas where people may congregate (with the exception of areas defined under categories A, B and D).
  - **C1** Areas with tables, etc. For example, areas in schools, cafes, restaurants, dining halls, reading rooms and receptions.
  - **C2** Areas with fixed seats. For example, areas in churches, theatres or cinemas, conference rooms, lecture halls, assembly halls, waiting rooms and railway waiting rooms.
  - **C3** Areas without obstacles for human movement. For example, areas in museums, exhibition rooms, etc. and access areas in public and administration buildings, hotels, hospitals and railway stations.
  - **C4** Areas with possible physical activities. For example, dance halls, gymnastic rooms and stages.
  - **C5** Areas used for large gatherings. For example, concert- and sports halls including stands, terraces, access areas and railway platforms.
- **D** Shopping areas
  - **D1** Areas in retail shops.
  - **D2** Areas in department stores.
Deflection
Interior fully-glazed partition deflection for the relevant loads should not be discomforting on contact or be so extreme that the frame cannot hold the glass.

It is recommended that the imposed load for interior non-load-bearing fully glazed partitions have a maximum displacement at a level with a handrail, i.e. 1200 mm above the floor level, 25 mm for fully glazed partitions with a different height level and 3 x the glass thickness, though max. 35 mm for fully glazed partitions without different height level.

Deflection in the centre of fully glazed partitions with a different level for imposed load and interior wind load respectively, should not be more than 30 mm for the relevant interior wind load.

The interior wind load deflection of non-load-bearing fully glazed partitions without a difference in level and height greater than 3 m should be further examined, as this can be designed.

The given heights for fully glazed partitions without a difference in level are based on the interior wind load in table 1 and a maximum allowed displacement of approx. 1/70 of height.

The above recommendations form the basis of the data in tables 2 and 3.

Glass
Glass calculations are made in accordance with the Danish Building Research Institute (SBi) 215:2008 guideline “Dimensioning of glass in the building envelope”, including glass strength and the reduction in glass thicknesses for laminated glass in the case of imposed load (payload).

In the case of reduced laminated glass thickness and imposed load, the coefficient of friction for film of 0.2 is used, cf. prEN 13474-3, and the estimated tensions are based on the permitted tension for load group C, cf. Sbi215.

4. Glass partition types
Two types of interior non-load-bearing glazed partitions are shown, secured in the top and bottom.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Horizontal loads</th>
<th>Interior wind loads</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(kN/m)</td>
<td>(kN/m²)</td>
</tr>
<tr>
<td>A, B and C1</td>
<td>0,5</td>
<td>0,28</td>
</tr>
<tr>
<td>C2 - C4, D1 and D2</td>
<td>1,0</td>
<td>0,28</td>
</tr>
<tr>
<td>C5</td>
<td>3,0</td>
<td>0,28</td>
</tr>
</tbody>
</table>
4.1 Glass as an interior vertical fully-glazed partition without a difference in level and without any safety function; clearly secured at the top and bottom.

Glass as interior vertical fully-glazed partition without any safety function. The glazed partition must be dimensioned for a line load \( q_k \), in accordance with table 1.

This horizontal load is not assumed to be higher than 1200 mm (\( h_r < 1200 \text{ mm} \)).

In table 2 this height is selected as 1,200 mm and the load is applied directly onto the glass.

Legend:
1 ceiling
2 glass
3 floor
4 glass
- line load \( q_k \) maintained in accordance with table 1,
- \( h_r \) height for horizontal load 1200 mm,
- \( h \) height/tension on the glazed partition,

![Figure 1](image-url)

**Table 2**

<table>
<thead>
<tr>
<th>Glass loads as per table 1</th>
<th>Maximum height of glass ( h ) (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Based on above details and according to chapter 3</td>
</tr>
<tr>
<td>Glass thickness (mm)</td>
<td>Laminated float+float</td>
</tr>
<tr>
<td>10,4</td>
<td>12,4</td>
</tr>
<tr>
<td>A, B and C1</td>
<td>1500</td>
</tr>
<tr>
<td>C2 to C4, D1 and D2</td>
<td>1600</td>
</tr>
<tr>
<td>C5</td>
<td>1500</td>
</tr>
</tbody>
</table>

It is assumed that there is no difference in floor levels and no movement in the adjoining building parts which may influence the glass. Horizontal load is calculated at 1.2 m from bottom of glass/floor.
4.2 Glass as interior fullyglazed partition with a difference in level and with a safety function; clearly secured at the top and bottom.

Glass as interior fullyglazed partition, vertical from floor to ceiling with safety function.

The glazed partition must be dimensioned for a line load $q_k$, in accordance with table 1.

This horizontal load is not assumed to be higher than 1200 mm ($h_r < 1200$ mm). In table 3 this height is selected as 1200 mm and the load is applied directly onto the glass.

In the case of a difference in level of over 0.5 m, laminated glass must be used in accordance with DS/INF119:2007.

Figure 2
Interior fully-glazed partition with a difference in level and with a safety function, clearly secured at the top and bottom.

Table 3

<table>
<thead>
<tr>
<th>Category</th>
<th>Glass thickness (mm)</th>
<th>Maximum height of glass $h$ (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Laminated float+float</td>
</tr>
<tr>
<td></td>
<td>A, B and C1</td>
<td>10,4 12,4 16,4</td>
</tr>
<tr>
<td></td>
<td>C2 to C4 D1 and D2</td>
<td>1600 1600 1800 2300 2800</td>
</tr>
</tbody>
</table>

It is assumed that there is a difference in floor levels and that the minimum width of glass is 0.9 - 1.0 m and no movement in the adjoining building parts which may influence the glass.

Horizontal load is calculated at 1,2 m from bottom of glass/floor.