PRELIMINARY REMARK

The contents of this information sheet have been jointly agreed upon by the following German exhibition companies:

Deutsche Messe AG Hannover
KölnMesse GmbH
Landesmesse Stuttgart GmbH
Leipziger Messe GmbH
Messe Berlin GmbH
Messe Düsseldorf GmbH
Messe Frankfurt Venue GmbH
Messe München GmbH
NürnbergMesse GmbH

It offers structural and design notes to Chapter 4.4.3 of the Technical Guidelines and defines the design specifications and requirements for the glass constructions in stand and decorative structures to be built within the trade fair halls of NürnbergMesse.

In the absence of additional specifications in this document, the Technical Guidelines (TR) of NürnbergMesse apply.

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**1. Scope**

Information sheet discusses the regulations concerning the use of glass in stand construction and design inside the trade fair halls NürnbergMesse. It does not apply to stand construction and design outside trade fair halls. Designing, dimension calculations and assembly of glass components for use inside trade fair halls require that the design, planning and assembly personnel involved is adequately qualified for glass construction projects. Glass structures which have received general construction approval (including European Technical Approval ETA) may be used in all cases in trade fair halls in accordance with the wording of the approval. This information sheet does not imp

**2. Definitions and explanations**

**2.1 Types of supports**

- Glazing secured by linear supports: Secured by linear supports on at least two opposite edges over the full length of each edge of the glass plate.
- Glazing secured at individual points: Glazing anchored through drilled holes or by a clamping system.

**2.2 Types of glass and other transparent plastics**

Types of glass granted statutory construction approval:
- Float glass (polished plate glass, SPG) as specified in DIN EN 572-9: Also called plate glass. It is characterised by relatively low ultimate flexural strength, and when destroyed, it fragments into large sharp-edged shards. Its use as single sheet glazing in trade fair construction is prohibited. If used in LG, it is permitted in trade-fair construction.
- Tempered safety glass (TSG) as specified in DIN EN 12150-2: TSG is a fully thermically pre-stressed type of glass. It has internal residual stress characteristics: core tensile stress and surface compression stress. It has high ultimate flexural strength and when broken, it shatters into crumb-like fragments. Where TSG is referred to in this information sheet, TSG made of float glass is always meant.
- Laminated safety glass (LSG): LSG consists of at least two sheets of PPG, TSG or HSG glass. The individual thicknesses of these are not permitted to differ from each other by a factor of more than 1.5. The sheets of glass are laminated together by intermediate film layers (PVB or SGP films). If a sheet is broken, then the film prevents the fragments from being scattered, thus providing residual load-bearing capacities and reducing the risk of injury from cuts.
- Heat-strengthened glass (HSG) as specified in DIN EN 1863-2 or with other general approvals by building authorities (German: allgemeine bauaufsichtliche Zulassung – abZ): TVG is a type of glass that is only partially thermically pre-stressed. Its ultimate flexural strength is lower than that of TSG (tempered safety glass). When broken, HSG fragments into shards which are larger than those of broken TSG. Therefore LSG sheets made of HSG have higher residual load-bearing capacities than LSG sheets made of TSG. HSG laminated with PVB film is included in Building Regulation List A. A general construction approval by building authorities (German allgemeine bauaufsichtliche Zulassung – abZ) for the SGP film is required for HSG laminated with SGP.

Not permitted, on the other hand, are transparent panels made of mostly thermoplastic plastics for which no recognized engineering rules or certificates of usability in buildings or structural installations are available. Examples:
- Acrylic glass (PMMA), sold under the brand names Plexiglas® or Perspex®, for example;
- Polycarbonate (PC), sold under the brand name Makrolon®, for example;
- Polymethyl methacrylate glycol (PET-G).

These materials may only be used for non-supporting, non-bracing components that are not intended to prevent falling, thus for decorative or ornamental applications, for example. In this case, however, due consideration must be given to the critical smoking and burning behaviour (e.g. normally flammable, strong smoke development) of these materials. In particular, the decorative use of such materials above persons is impermissible due to the frequently proven (burning) dripping behaviour in case of fire.

**2.3 Design calculation standards**

The static strength proof calculations for glass components must be carried out in accordance with the following design calculation concept and structural design standards (as amended): Glass in building design and construction rules.

DIN 18008 (T.1 - T.5) – Glass in building design and construction rules
- Part 1: Terms and general bases
- Part 2: Linearly supported glazing
- Part 3: Point-fixed glazing
- Part 4: Additional requirements for barrier glazing
- Part 5: Additional requirements for walk-on glazing

### Table 1: Design concept

<table>
<thead>
<tr>
<th>Design concept</th>
<th>Proof concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determination of action effects and stresses</td>
<td>Deformation checks</td>
</tr>
<tr>
<td>Designation of forces/stresses in the serviceability limit state SLS (forces due to characteristic loads, without γ_p)</td>
<td>Designation of forces/stresses in the ultimate limit state (ULS) (forces due to characteristic loads, multiplied by γ_p)</td>
</tr>
<tr>
<td>Designation of the limit stress</td>
<td>Dimension calculation rules, dimension calculation standards</td>
</tr>
</tbody>
</table>

Standards applying to loads and actions

**Normal load factors γ_p for permanent loads**
(e.g. dead loads)

**Normal load factors for variable loads and actions**
(e.g. dynamic pressure, imposed loads, cross-bar pressures)

Duration of loads typically encountered at trade fairs for k_out from DIN 18008-1, Table 6

**Load factor concept**

\[ \sigma \gamma_p < f_k^* k_{mod} / \gamma_s \]

At ULS (GZT)

At SLS (GZG)

SLS (GZG): after the number or index k after formula symbol e.g. supporting force = 12 kN (SLS) or \( F = 12 \text{kN} \)

ULS (GZT) after the number or index d after formula symbol e.g. supporting force = 16 kN (ULS) or \( F = 16 \text{kN} \)

\[ f_i = \frac{F}{k_{mod}} \]

DIN 18008-1 [12]
DIN 18008-2 [13]
DIN 18008-3 [14]
DIN 18008-4 [15]
DIN 18008-5 [16]

This information sheet and DIN EN 1991-1-1 DIN EN 1991-1-1/NA: (2010-12)

1.35

1.5

**Own weight:** permanent \( (k_{own} = 0.25) \)
Working loads: medium \( (k_{own} = 0.4) \)
Horizontal substitute load: short \( (k_{own} = 0.7) \)
Cross-bar pressure: short \( (k_{own} = 0.7) \)
Based on the above-mentioned standards and design calculation concept, verifiable static load calculations must be performed for all glass constructions and they must be built in conformance with the applicable standards, depending on the planned use as:

- Vertical glazing, including (where applicable) the function of preventing falls in the case of balustrades
- Overhead glazing.
- Walk-on glazing.

For static load calculations, the load factor concept shall be used as a basis. Supporting forces transmitted by glass components must always be stated for the GZT (ULS) so that the loads of the connected force-transmitting components of concrete, steel or wood can be calculated using the load-factor concept without transmission errors.

Note on the use of wire glass:
In consultation with the trade fair company, wire glass can still be used in existing components with certifications, based on the design calculation standards in effect at the time of initial construction of the trade fair stand.

2.4 Material properties of glass products
Glass products have a bulk density of 25 kN/m³, a thermal expansion coefficient of 8.4·10⁻⁶/K and their Young’s modulus is 70,000 N/mm².
For structural design calculations, the design calculation values of the resistance Rₚ listed in Table 1 must be observed.

Table 2: Normal material properties for design calculation concept B, application of load factors

<table>
<thead>
<tr>
<th>Property</th>
<th>Float glass (not printed, not sand-blasted)</th>
<th>HSG (not printed, not sand-blasted)</th>
<th>HSG (printed/ enamel-coated)</th>
<th>ESG (not printed, not sand-blasted)</th>
<th>ESG (printed/ enamel-coated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal limit stress fₛ, as</td>
<td>45 N/mm²</td>
<td>70 N/mm²</td>
<td>45 N/mm²</td>
<td>120 N/mm²</td>
<td>90 N/mm²</td>
</tr>
<tr>
<td>DIN EN 572-1</td>
<td></td>
<td></td>
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<tr>
<td>DIN EN 1863-1 or abZ</td>
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<tr>
<td>DIN EN 12150-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design coefficient kₚ, normal</td>
<td>1.1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Design coefficient kₚ, for laminated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>safety glass</td>
<td>1.1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Design coefficient kₚ, for calculating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>the effect of load durations kₚₑ</td>
<td>0.8</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Material factor γₛ</td>
<td>1.8</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Modification factor for</td>
<td></td>
<td></td>
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<tr>
<td>calculating the effect of load</td>
<td></td>
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<tr>
<td>durations kₚₑ</td>
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<tr>
<td>Rated value of the resistance to</td>
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<td></td>
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</tr>
<tr>
<td>stress failure Rₛ</td>
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</tr>
</tbody>
</table>

The intermediate films in LSG shall be made of PVB (polyvinyl butyral) or SGP (Sentry glass plus/Ionoplast):
- Films made of PVB must have a tear strength of at least 20 N/mm².
- Films or laminated safety glass made of SGP shall have general approval by building authorities (including European Technical Approval ETA) and shall be processed in accordance with this approval.

3. Stand design, construction and loads
3.1 Vertical glazing not intended to prevent falling
3.1.1 Vertical glazing with a height h > 4 metres above hall floor level
Neither static proof of structural characteristics in accordance with the regulations specified in Chapter 2.3 is required, nor is it necessary to submit documentation of testing. In this case the exhibitor alone is responsible for ensuring that the construction/design is technically safe for general use and that it meets current and accepted technical standards. Table A provides an overview of the types of structural designs that are possible.
- Either TSG or LSG must be used.
- The glass sheets may be secured by linear supports or at individual points.
- Glass walls tilting at an angle of more than 10° from the vertical are considered to be overhead glazing for which the provisions of Chapter 3.3 shall apply.
- Additional measures, e.g. provision of static proof calculations similar to those described in Chapter 3.2, may be required to ensure protection of neighbouring walkways, or to be able to bear the loads of persons leaning against or bumping into the glass.

3.1.2 Vertical glazing of height h > 4 metres above hall floor level
Vertical glazing not intended to prevent falling and whose upper-most edges are higher than 4 metres above hall floor level does not require installation approval for a specific case (c.f. 4.2).

Table B provides an overview of possible designs and the proofs required. All structural design details (including flexing/sag and glass insertion/clamping depths) shall be modelled in accordance with the rules described in Chapter 2.3.

The load-bearing capacity of the structure under impact action can be verified as follows:
- a pendulum impact test in accordance with DIN 18008-4
- the relevant design specifications, glass dimensions and thicknesses as stated in Table B of this information sheet are adhered to, or
- by providing proof calculations in accordance with the rules described in Chapter 2.3.

Table B contains an overview of possible designs and the proofs required. All structural design details (including flexing/sag and glass insertion/clamping depths) shall be modelled in accordance with the rules described in Chapter 2.3.

Experimental pendulum impact tests must be carried out by one of the test centres/institutes named in Chapter 4 well in advance of the fair and outside the trade fair halls.
3.2.1 Category A: Vertical glass wall
Definition: Linearly-supported vertical glazing that does not contain any load-bearing bars at capping height and is not protected by a rail or cross-bar located in front of it, making it suitable for the direct action of rain or cross-bar loads, e.g. glazing of full room height.

If protection is required to prevent persons falling from a height of more than 0.2 then it will be necessary to refer to the Technical Regulations for accident-prevention (barrier) glazing or DIN 18008-4.
- Only LSG shall be used.
- Verified proof of structural characteristics or static structural calculations suitable for verification, as well as a pendulum impact test (test in accordance with DIN EN 12 600 or DIN 18008-4) are required.
- The pendulum impact test is not required for glass with linear support or/and at individual points on at least two opposing sides.
- Only LSG shall be used.
- The glazing supports must provide adequate protection to the edges of the glass sheets.

3.2.2 Category B: Clamped glass balustrade with continuous handrail
Definition: Load-bearing glass balustrades held by linear supports secured by clamp-type base mountings, the individual glazing elements of which are connected by a continuous, load-bearing handrail (see example in Chapter 6.1) attached to the top of the structure.
- Only LSG shall be used.
- Verified proof of structural characteristics or static structural calculations suitable for verification, as well as a pendulum impact test (test in accordance with DIN 18008-4) are required.
- If LSG made of 2 x 10 mm TSG (or 2 x 10 mm HSG) is used, no pendulum impact test is required, provided that the dimensions as stated in Table B are adhered to (design details in accordance with DIN 18008-4).
- The thickness of the intermediate PVB/SGP film must be at least 1.52 mm.
- The securing clamps/clamping must be at least 100 mm above floor level.

Calculations shall be provided proving that the loads will be distributed via the capping to neighbouring glass sheets in the event of an individual sheet being destroyed. The stresses occurring in the neighbouring glass sheets can be classified as an extraordinary design calculation situation. The destroyed or damaged glass sheet shall be replaced immediately after the incident.

3.2.3 Category C: Railing and balustrade infills or glass walls with load-distributing cross-bar fitted in front of it
Definition: Accident-prevention (barrier) glazing which is not intended to distribute capping loads and which corresponds to one of the following groups:

C1: Railing/balustrade infill secured by linear supports and/or at individual points on at least two opposing sides.
C2: Vertical glazing beneath a crosswise load-distributing spanning member located at capping level and secured by linear supports on at least two opposing sides.
C3: Category A type glazing with a load-distributing handrail placed in front of it.

- For Category C1 and C2 type glazing, the use of TSG is allowed if the sheets are secured by linear supports on all sides. For all other types of supports and for Category C3, only LSG may be used unless other statutory construction approval exists.
- Table B contains an overview of possible designs and the proofs required.
- The pendulum impact test is not required if the relevant design specifications and the dimensions and thickness of the glass as stated in Table B or in DIN 18008-4 are adhered to.

Alternative measures/protection against glass breakage:
If the proof calculations for Category C in accordance DIN 18008-4 are not submitted for accident-prevention (barrier) glazing, then the accident-prevention (barrier) attribute can be achieved by installing adequately sturdy knee-height cross-bars or tightly stretched steel rope of at least 5 mm diameter at a vertical spacing of not more than 35 cm and at an adequate distance in front of the glass sheets of the balustrade infill. Measures to protect against scattering glass splinters shall always be installed above and along the length of traffic areas (walkways), if this is not possible, LSG shall be used.

3.3 Horizontal glazing
3.3.1 Overhead glazing
Glass walls tilted at an angle of more than 10° from the vertical are considered to be overhead glazing. Table C contains an overview of possible designs and the proof documentation required.

Only the following glass products may be used:
- LSG made with float glass (PPG)
- LSG made of HSG.
- Wire glass (only for existing components until effective span exceeding 0.7 m and the glass shall protrude into the supports by at least 15 mm).

In addition to submitting certification of load-bearing capacities, experimental of residual load-bearing capacities must be provided or, if this is not possible, a safety net must be hung under the glazing. If the structural design requirements of specified in DIN 18008-2 are met, proof of the residual load-bearing capacities in not required. The design loads to be assumed are the sheet’s own weight and a horizontal pressure corresponding to at least h1 = 0.125 kN/m² for visible surfaces of up 4 m above half floor level or h2 = 0.063 kN/m² for vertical visible surfaces at more than 4 m above half floor level.

The sheets must secured in such a way as to properly safeguard against them slipping out of the mounts and forces which may lift them off the mounts.

The design dimensions of glass sheets mounted at individual points and HSG sheets shall either be calculated according to the rules outlined in chapter 2.3 or they must have general construction approval (abZ).
If, for cleaning purposes, overhead glazing periodically has to support human loads, then such additional loads must be taken into consideration and experimental proof of residual load-bearing capacities must be provided [16]. In such cases, a special individual construction approval is always required.

Other design standards for overhead glazing:
- LSG sheets with an effective span exceeding more than 1.20 m shall be supported on all sides.
- The overall thickness of the intermediate PVB-/SGP-films must be at least 0.76 mm. If a sheet is supported on all sides, then a thickness of 0.38 mm is allowed under the condition that the effective span in the direction bearing the main load is not greater than 0.8 m.
- Cutting of recesses or notches in the glass sheets is not allowed.
- Only holes conforming to DIN 18008-3 are allowed.
- The maximum permissible sag shall not exceed 1/100 of the effective span between the closer supports of the sheet.

3.3.2 Glazing designed to support human loads

This kind of glazing is specifically intended to be subjected to persons walking over it, e.g. stairs, platforms, landings and cat-walks. The design and proof calculations shall take both dead loads (own weight) and the working loads into account. In addition, proof of impact resistance and residual load-bearing capacity shall be provided. Proof of impact resistance and residual load-bearing capacities must be demonstrated by component tests or a general construction approval (abZ). The requirements are specified in DIN 18008-5 [16]. For glazing mounted in linear supports at all four edges and an assumed working load of not more than 5.0 kN/m² for design calculations (as specified in DIN EN 1991-1-1/NA - Cat. C3/T2), proof of impact resistance and residual load-bearing capacity is deemed to have been provided if the sheets conform to the dimensions listed in Table 3.

Table 3: Glazing mounted in linear supports at all four edges and intended to support human loads, with proven impact resistance and residual load-bearing capacity

<table>
<thead>
<tr>
<th>max. length [mm]</th>
<th>max. width [mm]</th>
<th>LSG structure (top /*/ centre *// bottom)</th>
<th>Min. supporting surface depth [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500</td>
<td>400</td>
<td>8 HSG *// 10 Float *// 10 Float</td>
<td>30</td>
</tr>
<tr>
<td>1500</td>
<td>750</td>
<td>8 HSG *// 12 Float *// 12 Float</td>
<td>30</td>
</tr>
<tr>
<td>1250</td>
<td>1250</td>
<td>8 HSG *// 10 HSG *// 10 HSG</td>
<td>35</td>
</tr>
<tr>
<td>1500</td>
<td>1500</td>
<td>8 HSG *// 12 HSG *// 12 HSG</td>
<td>35</td>
</tr>
<tr>
<td>2000</td>
<td>1400</td>
<td>8 HSG *// 15 Float *// 15 Float</td>
<td>35</td>
</tr>
</tbody>
</table>

/* = 1.52 mm PVB – PVB or SGP (SentryGlas® plus)

Glazing designed to support human loads may be secured by linear supports or at individual points. It must be made of LSG consisting of at least three layers of TSG and/or HSG/float glass. From the point of view of impact resistance, the use of TSG or HSG for the top layer is recommended. This surface must possess non-slip characteristics in accordance with DIN 51097. In order to achieve the required residual load-bearing capacity, the two lower layers will normally be made of float glass or HSG.

Glazing, mountings and supporting structure must be designed and their dimensions calculated to withstand the load of their own combined weight (dead load) as well as intended human (working) loads in accordance with the applicable standards.

In the case of stairways, the construction/design must guarantee sufficient distribution of loads. Stairs on stand structures in the trade fair halls shall always be classified with usage category T2.
4. Approval procedures

4.1 Basics

If a glass component and its glass products conform to the technical building regulations outlined in Chapter 2.3 and to generally accepted technical principles, then it shall be sufficient to submit the verified or verifiable structural calculations and plans. After that, the verification will be performed and if the documents are verified, construction approval will be granted. In addition, the construction work on site will be checked and the results subjected to an approval inspection.

If additional components are installed for which statutory construction approval (abZ), a statutory construction test report (abP) or type approval are required, then these documents are to be submitted together with the structural calculations.

If a glass component or parts of this component do not conform to the construction engineering regulations and generally accepted technical principles outlined in chapter 2.3, and if no statutory construction approval or statutory construction test certificate can be produced, then an individual construction approval (Zustimmung im Einzelfall – ZIE) shall be required. An Installation Approval for a Specific Case may be granted by NürnbergMesse instead of the individual construction approval if glass is used only within the rules and limitations described in this information sheet.

4.2 Installation approval for a specific case

This approval procedure is similar to the procedure for obtaining an individual construction approval.

If an Installation Approval for a Specific Case has been granted once for a particular construction/design and type of usage, then the German trade fair companies in question will accept this for an identical design serving an identical purpose.

Nevertheless, a new application for construction work approval and approval inspection shall be submitted for each repeated case. The test report, all certificates and approvals, design details, as well as glass dimensions and thicknesses must be submitted with the application.

Glass components requiring approval and which require type 3 proof documentation are listed in column 14 of the Spreadsheets A, B and C. Installation approvals for specific cases cannot be granted at short notice, as they require a considerable period of time for processing. Applications for these should therefore be submitted at least 42 days before the commencement of construction.

Prior to conducting component tests, it is advisable to contact NürnbergMesse in good time in order to coordinate procedures and intended testing methods. Normally, component testing requiring statements stipulate inclusion of parts of the glass component’s actual substructure in order to simulate realistic loads.

The procedure for obtaining an Installation Approval for a Specific Case from NürnbergMesse is as follows:

- The structural calculations and the required certificates confirming the identity of the product(s) (glass manufacturer/processing company’s factory certificates) must be verified and checked by a publicly certified structural building surveyor and tester (in the field of steel, concrete and brick construction/engineering).
- The surveyor shall confirm that there are no objections with regard to the design’s suitability for use. It is his responsibility to decide on the necessity of additional testing of materials, impact resistance and whether further proof of residual load-bearing capacities must be obtained. The test report must be submitted to NürnbergMesse (Exhibition Technology Department, see Technical Regulations Chapter 4.2) along with the other application documents requesting the construction permit.
- Final approval will be granted on location following an inspection to confirm that the construction/design on site conforms to the previously inspected documents. The test engineer carrying out the monitoring and inspection acts on behalf of NürnbergMesse and at the expense of the requesting exhibitor/customer.

Recommended institutes for testing components used in glass construction/design are listed in Table D.

5. Notes on design and design calculations

Glass is a brittle material, any failure of which will occur spontaneously and without warning. Glass is sensitive to blows with hard, pointed objects.

These properties lead to the following guideline notes:

- Proof calculations for the load-bearing capacity of structural glass not only take into consideration the unbroken glass but always include an investigation of the broken or partially broken glass (proof of residual load-bearing capacity).
- The support design must ensure that glass sheets are not subjected to pressure or stresses by the supports.
- Direct glass-to-glass contact and contact between glass and other hard materials (e.g. metal) shall be prevented at all times, whereby the effects of load and temperature fluctuations have to be taken into account.
- The minimum supporting depths of glass sheets (“glass insertion depth”) on their respective support sections as well as the allowable sheet and supporting beam sections as specified in Chapter 2.3 for the design calculation concept must be adhered to.
- After glazing has been installed, the markings identifying the individual type of glass sheet used (e.g. TSG, HSG) must be durable and legible at all times. In the case of LSG glazing, a section of the edge must be left free for inspection purposes (to check the number of glass sheets, thickness, interlayer films) until the construction has been approved. If required, a manufacturer’s certificate shall be submitted as well.
- The edges of glass sheets must be finished or protected in such a way as to exclude any possibility of injury.
- In the case of TSG, HSG, or LSG glazing manufactured from sheets of TSG or HSG, subsequent reworking of the finished product such as cutting out sections or drilling holes is not possible.
- Sheets intended to bear human loads must have a durable non-slip surface finish.
- Load-bearing adhesive joints may only be used if a general construction approval (abZ) has been granted for the entire adhesive system (i.e. the glass, adhesive and metal combination), and under the condition that the joint is made exactly as described in the approval documents. The rules described in Chapter 2.3 do not yet make allowance for applying more favourable assumptions of the joint effect of the intermediate film layers in LSG and therefore an Installation Approval for the Specific Case has to be applied for if these assumptions are used in calculations. Trade publications [18] contain information on suitable calculation assumptions to account for the joint effects in LSG. This may possibly be useful for LSG in which SGP is used.

6. Examples of vertical glazing in structures designed to prevent falls

All possible dimensions, types of glass, thicknesses and the necessary proof documents are summarised in Table B.

6.1 Category B

Note:

If LSG made of

- 10 mm TSG + 1.52 mm PVB/SGP + 10 mm TSG, or
- 10 mm HSG + 1.52 mm PVB/SGP + 10 mm HSG

in the dimensions as stated in Table B is used, only static structural proof calculations are required.

As specified in DIN 18008-4, this also applies to parallelogram-shaped balustrades.
Information Sheet
“Glass in stand construction inside trade fair halls” 2021 (continued)

6.2 Category C1 (railing infills)

6.2.1 Railing infills secured vertically on 2 sides

Note: If the types of glass and the dimensions listed in Table B are used, only static structural proof calculations are required.

6.2.2 Railing infills secured horizontally on 2 edges

Note: If the types of glass and the dimensions listed in Table B are used, only static structural proof calculations are required.

6.2.3 Railing infills secured on 4 sides

Note: If the types of glass and the dimensions listed in Table B are used, only static structural proof calculations are required.

6.2.4 Point-fixed with drilled anchors (design specifications according to DIN 18008-4)

Note: If the types of glass and the dimensions listed in Table B are used, only static structural proof calculations are required for all point-fixed variants sided or 4-sided.

In accordance with DIN 18008-4, the rules for Categories C1 and C2 also apply to parallelogram-shaped balustrades:

Category C1

Figure 4: Cross-section of clamping plate holder

Category C2

Figure 5: Cross section of edge clamp holder

6.2.5 Railing infills with point mounting, lateral clamps and anti-slip grips

Note: Designs that have a general construction approval (abZ) shall be used in accordance with the specifications in the approval documents.

For all systems that have not been granted general construction approval, a pendulum impact test is required. Minimum requirement: LSG comprising:

- 6 mm TSG + 1.52 mm PVB + 6 mm HSG or
- 6 mm HSG + 1.52 mm PVB + 6 mm HSG

shall be used.

6.2.6 Railing infills with point mounting and clamps at top and bottom

Note: System designs that have a general construction approval (abZ) shall be used in accordance with the specifications in the approval documents.

For all systems that have not been granted general building approval, a pendulum impact test is required. Minimum requirement: LSG comprising:

- 6 mm TSG + 1.52 mm PVB + 6 mm TSG,
- 6 mm HSG + 1.52 mm PVB + 6 mm HSG

shall be used.

6.3 Balustrade with fixed horizontal bars (protection against falling is provided solely by suffi-ciently strong handrails and knee-height bars)

Alternative measures: If the proof calculations for Category C in accordance DIN 18008-4 are not submitted for accident-prevention (barrier) glazing, then the accident-prevention (barrier) attribute can be achieved by installing adequately sturdy knee-height cross-bars or tightly stretched steel rope (at least 5 mm diameter) at a vertical spacing of not more than 35 cm and at an adequate distance in front of the glass sheets of the balustrade infill.

Note: In this case (with horizontal bars), the type of glass used can meet the specifications of Part 9 - Table A, glazing not intended to protect against falls.

In the case of accident prevention balustrades in areas that are freely accessible to the general trade fair public, only vertical cross-bars should be used at the above-mentioned distance in front of the glass sheets, so as to prevent people (particularly children) from climbing over the balustrades.
7. Construction engineering regulations, generally accepted rules of engineer-ing and references


[14] DIN 18008-3 (July 2013) Glass in building design and construction rules - Part 3: Point fixed glazing


[16] DIN 18008-5 (July 2013) Glass in Building design and construction rules - Part 5: Additional requirements for walk-on glazing


[19] Building Rules List (see www.dibt.de)

[20] ETB Guideline: Building components designed to prevent falls (June 1985)
**Information Sheet “Glass in stand construction inside trade fair halls” 2021 (continued)**

9. Spreadsheets A – D (for stand construction)

Table A: Vertical glazing, not intended to prevent falls

<table>
<thead>
<tr>
<th>Structure type</th>
<th>Characteristic</th>
<th>Structure</th>
<th>Sheet support</th>
<th>Glass type</th>
<th>Allowed, yes/no</th>
<th>Glass thickness in mm</th>
<th>SGP/PVB film thickness</th>
<th>Width in mm min.</th>
<th>Width in mm max</th>
<th>Height in mm min.</th>
<th>Height in mm max</th>
<th>Min. glass insertion depth in mm</th>
<th>Type of proof required</th>
<th>Civil engineering rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass wall ≤ 4.0 m above floor level</td>
<td>Linear support on 2 sides</td>
<td>TSG</td>
<td>yes</td>
<td>2.5</td>
<td></td>
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<td>Linear support on 4 sides</td>
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<tr>
<td>Glass wall &gt; 4.0 m above floor level</td>
<td>Linear support on 2 sides</td>
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<tr>
<td>Railing infill system with cross-bar and fall-prevention crossbars at knee-height (the actual glass sheet has no barrier function)</td>
<td>Linear support on 2 sides</td>
<td>TSG</td>
<td>yes</td>
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<td>Linear support on 4 sides</td>
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<td>Acrylic glass</td>
<td>yes</td>
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</tr>
</tbody>
</table>

**Proof type [column 14]:**

1: No specific proof
2: Verified static calculations
3: Installation appr. for spec. case
4: Pendulum impact test
5: Heat soak test
6: Residual load-bearing cap. test
7: Shock impact resistance test

1) Proof type 2 (verified static design calculations) are not required for sheet areas A ≤ 1.6 m² and d ≥ 4 mm
2) Wire glass may continue to be used in existing components if documentation has been submitted of compliance with the technical standards in effect at the time of initial installation.
Table B: Vertical glazing, intended to prevent falls (barrier glazing)

<table>
<thead>
<tr>
<th>Structure type</th>
<th>Structure characteristic</th>
<th>Sheet support</th>
<th>Glass type</th>
<th>Glass thickness in mm</th>
<th>SG/PVB film thickness</th>
<th>Width in mm</th>
<th>Min.</th>
<th>Max.</th>
<th>Height in mm</th>
<th>Min.</th>
<th>Max.</th>
<th>Min. glass insertion depth in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balustrade/parapet, clamped at the bottom, with handrail (cat. B as defined in TRAV)</td>
<td>Linear support on 2 sides</td>
<td>TSG</td>
<td>no</td>
<td>0.76</td>
<td></td>
<td>500</td>
<td>1200</td>
<td>2000</td>
<td>1000</td>
<td>2500</td>
<td>5000</td>
<td>18</td>
</tr>
<tr>
<td>Railing infill (cat. A as defined in TRAV)</td>
<td>Linear support on 2 sides</td>
<td>LSG 2 layers</td>
<td>yes</td>
<td>1.2</td>
<td>1.52</td>
<td>500</td>
<td>1200</td>
<td>2000</td>
<td>1000</td>
<td>2500</td>
<td>5000</td>
<td>18</td>
</tr>
<tr>
<td>Glass wall with bad-bearing/protective handrail in front of it (cat. C3 as defined in TRAV)</td>
<td>Linear support on 4 sides</td>
<td>TSG</td>
<td>no</td>
<td>0.76</td>
<td></td>
<td>500</td>
<td>1200</td>
<td>2000</td>
<td>1000</td>
<td>2500</td>
<td>5000</td>
<td>18</td>
</tr>
<tr>
<td>Vertical glazing, barrier (Δh &gt; 1 m)</td>
<td>Linear support at one edge</td>
<td>TSG</td>
<td>no</td>
<td>0.76</td>
<td></td>
<td>500</td>
<td>1200</td>
<td>2000</td>
<td>1000</td>
<td>2500</td>
<td>5000</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Linear support on 2 sides oben u. unten</td>
<td>LSG 2 layers</td>
<td>yes</td>
<td>1.2</td>
<td>1.52</td>
<td>500</td>
<td>1200</td>
<td>2000</td>
<td>1000</td>
<td>2500</td>
<td>5000</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Linear support on 2 sides links u. rechts</td>
<td>TSG</td>
<td>no</td>
<td>0.76</td>
<td></td>
<td>500</td>
<td>1200</td>
<td>2000</td>
<td>1000</td>
<td>2500</td>
<td>5000</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Linear support on 4 sides</td>
<td>TSG</td>
<td>no</td>
<td>0.76</td>
<td></td>
<td>500</td>
<td>1200</td>
<td>2000</td>
<td>1000</td>
<td>2500</td>
<td>5000</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Point supports</td>
<td>TSG</td>
<td>no</td>
<td>0.76</td>
<td></td>
<td>500</td>
<td>1200</td>
<td>2000</td>
<td>1000</td>
<td>2500</td>
<td>5000</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Railing infill (cat. C1 as defined in TRAV)</td>
<td>LSG 2 layers</td>
<td>yes</td>
<td>1.2</td>
<td>1.52</td>
<td>500</td>
<td>1200</td>
<td>2000</td>
<td>1000</td>
<td>2500</td>
<td>5000</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Glass wall with load-bearing/protective handrail in front of it (cat. C3 as defined in TRAV)</td>
<td>TSG</td>
<td>no</td>
<td>0.76</td>
<td></td>
<td>500</td>
<td>1200</td>
<td>2000</td>
<td>1000</td>
<td>2500</td>
<td>5000</td>
<td>18</td>
</tr>
</tbody>
</table>

Proof type [column 14]:
1: No specific proof
2: Verified static calculations
3: Installation appr. for spec. case
4: Pendulum impact test
5: Heat soak test
6: Residual load-bearing cap. test
7: Shock impact resistance test

If a pendulum impact test, proof type "4", is not specified in column 14, then this advantage is subject to adherence to the limit values stated in columns 7 to 13. Structural designs not listed here will require an Installation Approval for the Specific Case.

2) In systems having a valid general statutory construction approval, LSG may be used in accordance with the text of the approval documents.
3) The distance between neighbouring point supports in x-direction and in y-direction, respectively.
4) Clamped on both faces by circular plates with diameter d ⇒ 50 mm, if spacing is greater than 1200 mm, plate diameter shall be d ⇒ 70 mm, see DIN 18008-3/4

The use of acrylic glass and wire glass is not allowed for vertical glazing intended to prevent falls (barrier glazing). If the sheets are held in linear supports, LSG made of HSG and with the same specified thicknesses may be used instead of LSG made of float glass.
### Table C: Horizontal glazing

<table>
<thead>
<tr>
<th>Structure type</th>
<th>Characteristic</th>
<th>Structure</th>
<th>Sheet support</th>
<th>Glass type</th>
<th>Allowed, yes/no</th>
<th>Glass thickness in mm (top/<em>/centre/</em>/bottom)</th>
<th>Type of proof required</th>
<th>Civil engineering rules</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Linear support on 2 sides</td>
<td>TSG</td>
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<td>0.76</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Linear support on 4 sides</td>
<td>TSG</td>
<td>yes</td>
<td>0.76</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Point supports</td>
<td>Wire glass</td>
<td>no</td>
<td>1.52</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Linear support on 2 sides</td>
<td>TSG</td>
<td>no</td>
<td>0.76</td>
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<td></td>
<td>Linear support on 4 sides</td>
<td>TSG</td>
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<td></td>
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<td>Point supports</td>
<td>Wire glass</td>
<td>no</td>
<td>1.52</td>
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<td></td>
<td>Linear support on 2 sides</td>
<td>TSG</td>
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<td>Linear support on 4 sides</td>
<td>TSG</td>
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<td>Linear support on 4 sides</td>
<td>TSG</td>
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#### Proof type (column 14):

1. No specific proof
2. Verified static calculations
3. Installation appr. for spec. case
4. Pendulum impact test
5. Heat soak test
6. Residual load-bearing cap. test
7. Shock impact resistance test

- Overhead glazing that has to be capable of supporting human loads to permit cleaning is subject to a special approval procedure.
- The data apply to the smaller distance between supports (support direction).
- If HSG which has not received general statutory construction approval (abZ) is used, an additional Installation Approval for the Specific Case is required.
- If glass type/support type combination systems which have been granted a general statutory construction approval (abZ) are used, the Installation Approval for the Specific Case is not required.
- Wire glass may continue to be used in existing components if documentation has been submitted of compliance with the technical standards in effect at the time of initial installation.

The use of acrylic glass for horizontal glazing is not allowed. However, exceptions may be possible if the trade-fair company has no objections with regard to fire prevention/protection and structural stability.
### Table D: Recommended institutions for conducting component tests of glass designs

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<tr>
<th>Institution Name</th>
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<tr>
<td>Technische Universität Dresden, Institut für Baukonstruktionen (Beyer-Bau)</td>
<td>Prof. Dr.-Ing. Weller, August-Bebel-Straße 30, 01219 Dresden</td>
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<tr>
<td>TU Hamburg - Harburg, Institut für Baustatik und Stahlbau</td>
<td>Prof. Dr.-Ing. Starossek, Denickestraße 7, 21073 Hamburg</td>
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<tr>
<td>Leibnitz-Universität Hannover, Institut für Massivbau</td>
<td>Prof. Dr.-Ing. Marx, Appelstraße 9a, 30167 Hannover</td>
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<tr>
<td>Materialprüfanstalt für das Bauwesen Braunschweig</td>
<td>Beethovenstraße 52, 38106 Braunschweig</td>
<td>Braunschweig</td>
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<tr>
<td>MPA Nordrhein-Westfalen</td>
<td>Marsbruchstraße 186, 44287 Dortmund</td>
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<tr>
<td>RWT Aachen, Lehrstuhl für Stahlbau</td>
<td>Prof. Dr.-Ing. Feldmann, Mies-van-der-Rohe-Straße 1, 52074 Aachen</td>
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<tr>
<td>MPA Darmstadt</td>
<td>Grafenstraße 2, 64283 Darmstadt</td>
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<tr>
<td>TU Darmstadt, Institut für Werkstoffe und Mechanik im Bauwesen</td>
<td>Prof. Dr.-Ing. Wörner, Franziska-Braun-Straße 3, 64287 Darmstadt</td>
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<tr>
<td>FMPA Baden-Württemberg</td>
<td>FB 2, Abt. 21, Referat 214, Pfaffenwaldring 4, 70569 Stuttgart (Vaihingen)</td>
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<tr>
<td>Universität Karlsruhe</td>
<td>Versuchsanstalt für Stahl, Holz und Steine, Prof. Dr.-Ing. Ummenhofer, Otto-Amman-Platz 1, 76131 Karlsruhe</td>
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<tr>
<td>Friedmann &amp; Kirchner</td>
<td>Gesellschaft für Material- und Bauteilprüfung, Große Ahlmühle 7, 76865 Rohrbach</td>
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<tr>
<td>FH München, Labor für Stahl- und Leichtmetallbau</td>
<td>Prof. Dr.-Ing. Bucak, Karlstraße 6, 80333 München</td>
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<tr>
<td>TU München, Lehrstuhl für Metallbau</td>
<td>Prof. Dr.-Ing. Mensinger, Arcisstraße 21, 80333 München</td>
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<tr>
<td>Institut für Fenstertechnik e.V.</td>
<td>Theodor-Grietl-Straße 7-9, 83025 Rosenheim</td>
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