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Glass in building — Glazing and airborne sound insulation — Product descriptions and determination of properties

Verre dans la construction — Vitrages et isolation aux bruits aériens — Description des produits et détermination des propriétés

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 22897 was prepared by Technical Committee ISO/TC 160, *Glass in building*, Subcommittee SC 2, *Use considerations*.

This International Standard is based on EN 12758, prepared by Technical Committee CEN/TC 129, *Glass in building.*

Glass in building — Glazing and airborne sound insulation — Product descriptions and determination of properties

1 Scope

This International Standard assigns sound insulation values to all transparent, translucent and opaque glass products that are intended to be used in glazed assemblies in buildings, and which exhibit properties of acoustic protection, either as a prime intention or as a supplementary characteristic.

It outlines the procedure by which glass products can be rated according to their acoustic performance, which enables assessment of compliance with the acoustic requirements of buildings.

Rigorous technical analysis of measurement data remains an option, but this International Standard is intended to enable the derivation of simpler indices of performance, which can be adopted with confidence by non-specialists.

By adopting the principles of this International Standard, the formulation of acoustic requirements in building codes and of product specifications to satisfy particular needs for glazing is simplified.

It is recognized that the acoustic test procedures of ISO 140-1 and ISO 140-3 relate fully only to glass panes and their combinations. Although the same principles should be followed as closely as possible, it is inevitable that some compromises are necessary, because of the bulkier construction of other glazing types. Guidelines on how to adapt these to include glass blocks, bricks, structural glazing, channel-shaped glass and pavers are given in Clause 4.

NOTE With regard to the performance variation in windows, all the considerations of this International Standard relate to glass alone. Incorporation of glass into windows can cause changes in acoustic performance, owing to other influences, including frame design, frame material, mounting method and air tightness. Measurements of the sound insulation of complete windows (glass and frame) can be undertaken to resolve such issues.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 140-1, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 1: Requirements for laboratory test facilities with suppressed flanking transmission*

ISO 140-3, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 3: Laboratory measurements of airborne sound insulation of building elements*

ISO 717-1, *Acoustics — Rating of sound insulation in buildings and of building elements — Part 1: Airborne sound insulation*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
single glass
single leaf of homogeneous or monolithic glass, including annealed, toughened (by heat or chemical treatment) and coated glasses

3.2
wired glass
glass with a layer of wire mesh completely embedded in the glass

NOTE The presence of wire is found not to modify the basic acoustic performance from that associated with homogeneous glass of the same overall thickness. For the purposes of this International Standard, wired glass is, therefore, included in the definition of "single glass."

3.3
laminated glass
assembly consisting of one sheet of glass with one or more sheets of glass and/or plastics glazing sheet material joined together with one or more interlayers

NOTE The most common laminated material is polyvinyl butyral (PVB). When referring to laminated glasses, the interlayer type and make-up should be specified, owing to probable differentiation of acoustic performance.

3.4
insulating glass units
hermetically sealed units having two or more glasses in their construction, separated by cavities which usually contain dry air but which may contain other gases for special purposes

3.5
multiple glazing
two glasses separated by unsealed cavities, or, if held in proprietary framing, as secondary sashes

3.6
glass blocks and pavers
two halves of transparent, translucent and/or coloured glass, typically 12 mm thick, that are fused together and fully sealed, although not with dry air

NOTE 1 Pavers are primarily designed to be load-bearing to pedestrian or vehicular traffic.

NOTE 2 Because opposite faces of these products comprise thick glass with significant separation, their associated sound insulation can be of importance.

3.7
structural sealant glazing and structural assemblies
assemblies of glass held in position with bolts and/or adhesive fixing (with or without supporting structures)

NOTE Acoustically, such assemblies may behave differently from their framed equivalents, and laboratory measurements of performance are strongly recommended. Care should be taken to ensure that a representative sample of bolts, joints, etc., is included in the test sample.

3.8
channel-shaped glass
glass, typically 3 m long and 300 mm wide, and shaped into a U-section, whose smaller arms are of the order of 50 mm long

NOTE Walls may be built of these components by joining them together, as a single or double skin, using a suitable flexible sealant. When the acoustic performance of such structures is required, testing of a representative sample of the particular configuration should be undertaken.

4 Test methods

Acoustic performance data shall be obtained under the conditions specified in ISO 140-1, ISO 140-3 and ISO 717-1. For laminated glasses, owing to temperature dependency, the specimen temperatures shall be between 17 °C and 23 °C.

For best reproducibility, it is recommended that the test opening for glass panes, as described in Annex C of ISO 140-1:1997, be adopted.

Some variations in panel size, etc. from those in ISO 140-1 may be necessary for glass blocks, pavers, structural assemblies and channel-shaped glass, in order to include a valid representation of all their features as referred to in Clause 1, and as described in 3.6, 3.7 and 3.8.

Acoustic measurements of the performance of these products shall be made on assemblies or arrays of them, and not on individual elements. Factors which influence testing are size, jointing, etc.

NOTE For large mixed components it may be more appropriate to employ intensity measurement techniques, according to the advice of a specialist.

Test reports on the sound insulation of glazing shall be obtained from measurements made under the conditions specified in ISO 140-1 and ISO 140-3 or, as closely as possible, for some unconventional glazings, as acknowledged above. In all cases, constructional details shall be included, with a description, where appropriate, of

a) type of glass

b) glass thickness(s);

c) airspace(s)/cavity width(s);

d) glass filling – type and concentration;

e) interlayer build-up (type, thickness and number) for laminated glass;

f) specimen temperature for laminated glass;

g) the particular mounting conditions for assemblies of glass blocks, pavers, structural sealant glasses and channel-shaped glass, owing to necessary deviation from the prescribed conditions of ISO 140-3.

5 Sound insulation rating and classification

5.1 Sound insulating rating

The procedures for deriving the values of the sound reduction index (R), the weighted sound reduction index (R_w), the spectrum adaptation term for A-weighted pink noise (C), and spectrum adaptation term for A-weighted urban traffic noise (C_{tr}) are specified in ISO 140-3 and ISO 717-1.

NOTE Information on repeatability and reproducibility for airborne sound indices and weighted airborne sound reduction indices will be given in ISO 10140-2. The reproducibility of C and C_{tr} may differ from that of R_w, and from each other, because their derivations are dependent upon dominant frequencies, whose measurement precision can correspondingly differ.

Proper evaluation of these parameters depends on the corresponding basic sound insulation data (viz. SRI values) being obtained from measurements, in accordance with ISO 140-1 and ISO 140-3.

5.2 Statement of acoustic performance of glass

The acoustic performance of glass shall be stated in accordance with ISO 717-1, which requires the disclosure of R_w and the corresponding spectrum adaptation terms C and C_{tr}. The R_w index and corresponding spectrum adaptation terms, C and C_{tr}, shall be stated, in accordance with ISO 717-1.

Both spectrum adaptation terms shall be stated, in brackets after the basic R_w index, separated by a semi-colon, i.e.

$$R_w\ (C;C_{tr})$$

EXAMPLE 12 mm single glass as shown in Annex A equals 34 (0;–2).

5.3 Specification of glazing requirements

Performance requirements may be either in terms of the R_w index alone, or as the sum of the R_w and the relevant spectrum adaptation term The latter results in a closer indication of the required acoustic performance for particular applications. For example, for traffic noise,

$$R_{tr} = R_w + C_{tr}$$

EXAMPLE R_{tr} for 12 mm single glass as shown in Annex A equals $34 + (-2) = 32$.

NOTE Annex B gives glazing recommendations.

6 Typical performance data

In the absence of specific measured performance data from which to calculate R_w, C and C_{tr}, Annex A includes values for a wider range of glazings.

Annex A states the generally accepted values of R, R_w, C and C_{tr} for a range of glass products.

In referring to this Annex, it is essential to note the following.

a) These data refer to soda lime silicate glasses (the most common type).

b) The data for the double glazing units may be adopted for air-, or argon-filled cavities.

c) Over the cavity width range 6 mm to 16 mm, the corresponding acoustic data for a given glass combination are regarded as constant.

d) For patterned glasses, whose thickness varies, the acoustic data corresponding to the next lower thickness from its nominally assigned thickness shall be adopted (e.g. 6 mm patterned glass is described acoustically by the data for 5 mm single glass).

e) For laminated glass with a non-plastic interlayer, the acoustic data corresponding to monolithic glass of the same thickness shall be adopted. If such a product does not exist, the data corresponding to the next lower thickness is appropriate.

f) The octave band values have been derived from one-third-octave-band data.

g) The laminated glass data relates only to that with plastic interlayers.

For products not covered by Annex A, relevant test data shall be made available from which the corresponding values of R_w, C and C_{tr} may be derived.

Annex A
(informative)

Typical performance data

Type of glass and thickness mm	Sound reduction index R (dB) at octave-band centre frequency (Hz)						Indices and adaptation terms		
	125	250	500	1 000	2 000	4 000	R_w	C	C_{tr}
Monolithic glass									
3	14	19	25	29	33	25	28	–1	–4
4	17	20	26	32	33	26	29	–2	–3
5	19	22	29	33	29	31	30	–1	–2
6	18	23	30	35	27	32	31	–2	–3
8	20	24	29	34	29	37	32	–2	–3
10	23	26	32	31	32	39	33	–2	–3
12	27	29	31	32	38	47	34	0	–2
Laminated glass									
6	20	23	29	34	32	38	32	–1	–3
8	20	25	32	35	34	42	33	–1	–3
10	24	26	33	33	35	44	34	–1	–3
Insulating glass units [a]									
4/(6-16)/4	21	17	25	35	37	31	29	–1	–4
6/(6-16)/4	21	20	26	38	37	39	32	–2	–4
6/(6-16)6	20	18	28	38	34	38	31	–1	–4
8/(6-16)/4	22	21	28	38	40	47	33	–1	–4
8/(6-16)/6	20	21	33	40	36	48	35	–2	–6
10/(6-16)/4	24	21	32	37	42	43	35	–2	–5
10/(6-16)/6	24	24	32	37	37	44	35	–1	–3
6/(6-16)/6 Laminated	20	19	30	39	37	46	33	–2	–5
6/(6-16)/10 Laminated	24	25	33	39	40	49	37	–1	–5

NOTE These tabulated values are derived from the mean value minus one standard deviation of typical measured data. As such, they represent conservative values which may be adopted in the absence of specific measured data, in accordance with Clause 4.

[a] Glass thickness/cavity width/glass thickness.

Annex B
(informative)

Glazing recommendations

To maximize acoustic benefits, the laminated component of an insulating glass unit is normally glazed to the warm side; i.e. usually to the inside of a building.

With insulating glass units incorporating monolithic glass of differing thicknesses, there is no preferred way; i.e. acoustic benefit is not dependent on which glass is outmost.

Bibliography

[1] ISO 10140-2[1)], *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 2: Airborne measurement principles*

[2] EN 12758, *Glass in building — Glazing and airborne sound insulation — Product descriptions and determination of properties*

1) Under preparation.

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