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Glass in building - Mirrors from silver-coated float glass for internal use

Verre dans la construction - Miroirs en glace argentée pour l'intérieur

Glas im Bauwesen - Spiegel aus silberbeschichtetem Floatglas für den Innenbereich

This European Standard was approved by CEN on 22 March 1999.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 129 "Glass in building", the secretariat of which is held by IBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 1999, and conflicting national standards shall be withdrawn at the latest by October 1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies minimum quality requirements (in respect of optical, visual and edge faults) and durability tests for mirrors from silvered float glass, for internal use in building.

This standard applies only to mirrors from silvered glass manufactured from flat annealed clear or tinted float glass, 2 mm to 6 mm thickness, and supplied in stock/standard sizes and as-cut finished sizes.

This standard does not apply to mirrors from silvered glass manufactured from any basic glass other than float glass, any processed glass, i.e. thermally toughened safety glass, heat strengthened glass, chemically strengthened glass and laminated glass, and any bent glass.

For mirrors from silvered glass used in aggressive and/or constantly high humidity atmospheres,e.g. horse riding halls, swimming pools, medical baths,saunas etc. this standard is not applicable. This standard is not applicable to reflective glass for external glazing applications.

This standard does not apply to framing, fixing or other support systems.

NOTE: Useful advice on these items is contained in the informative annex B.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

EN 572-1	Glass in building - Basic soda lime silicate glass products - Part 1 : Definitions and general physical and mechanical properties
EN 572-2	Glass in building - Basic soda lime silicate glass products - Part 2 : Float glass
ISO 2409	Paints and varnishes - Cross-cut test
ISO 9227	Corrosion tests in artificial atmospheres – Salt spray tests
ISO 5740	Road vehicles - Rear view mirrors - Test method for determining reflectance

3 Definitions

For the purposes of this standard, the following definitions apply:

3.1 float glass: Flat, transparent, clear or tinted soda-lime silicate glass having parallel and polished faces obtained by continuous casting and flotation on a metal bath. See EN 572-1 and EN 572-2.

3.2 mirror from silver-coated float glass: Flat annealed clear or tinted float glass whose rear surface has been coated with a protected reflective silver deposit.

3.3 stock/standard sizes: Panes of mirrors from silver-coated float glass supplied with as-cut edges which are intended for further processing. For dimensions of jumbo sizes and split sizes see EN 572-2.

3.4 as-cut finished sizes: Finished panes of mirrors from silver-coated float glass cut from stock/standard sizes. They may be subject to further processing, e.g. edgeworking, drilling, face decoration etc.

3.5 optical faults: Faults directly associated with the distortion of the reflected image.

3.6 glass appearance faults: Faults which alter the visual quality of the mirror from silver-coated float glass. They can be spot and/or linear and/or enlarged area faults.

3.7 spot faults: Nuclei (solid or gaseous inclusions), deposits, crush marks etc. In certain instances spot faults are accompanied by a distortion zone called 'halo'. The nucleus of the spot fault is measurable.

3.8 linear defects: Scratches, extended spot faults etc.

3.9 hairline scratches: Very fine circular scratches that can hardly be seen and are associated with glass cleaning techniques.

3.10 reflective silver coating faults: Faults in the reflective silver layer which will alter the appearance of the silvered glass. They consist of scratches, stain, colour spots and edge deterioration.

3.11 stain: Alteration of the reflective coating characterized by a more or less brownish, yellowish or greyish colouration of zones which can sometimes cover the whole reflective surface.

3.12 colour spots: Alteration of the reflective coating in the form of small, generally coloured spots.

3.13 edge deterioration: Discolouration of the reflective silver at the edge of the silvered glass.

3.14 protective coating(s) faults: Faults where the metallic layer is exposed. They can be scratches or loss of adhesion of the protective coating(s).

3.15 edge faults: Faults that affect the as-cut edge of the silvered glass. They can include entrant/emergent faults, shelling, corners on/off and vents.

3.16 pack area: The total surface area of the contents of a pack.

3.17 cluster: A group of not less than 3 spot faults, separated by not more than 50 mm.

3.18 halo: Distortion zone around a spot fault (see 3.7).

4 Materials

4.1 Glass products

Mirror from silver-coated float glass, according to this standard, shall be manufactured from monolithic float glass conforming to EN 572-2.

4.2 Reflective coating

In order to provide the quality of a silvered mirror reflection, the mirror shall be manufactured with at least 0,7 g/m^2 of silver.

4.3 Protective coating(s)

The reflective coating described in 4.2 shall be protected by a layer of metallic copper or another material and one or more protective coatings e.g. paint, laquer etc.

5 Dimensional requirements

5.1 Thickness

The actual thickness shall be the average of four measurements, taken to the nearest 0,01 mm, one taken at the centre of each side. Measurement shall be by means of an instrument of the calliper micrometer type.

The actual thickness, rounded to the nearest 0,1 mm shall not vary from the nominal thickness by more than the tolerances shown in table 1.

Table 1: Thicknesses and tolerances

Nominal thickness (mm)	Thickness tolerances (mm)
2	± 0,2
3	± 0,2
4	± 0,2
5	± 0,2
6	± 0,2

5.2 Length, width and squareness

5.2.1 Stock/standard sizes

Length, *H*, and width, *B*, are defined with reference to the direction of draw of the float glass ribbon as shown in figure 1.

The nominal dimensions for length, *H*, and width, *B*, being given, the pane shall not be larger than a prescribed rectangle resulting from the nominal dimensions increased by the permissible plus tolerance or smaller than a permissible rectangle reduced by the permissible minus tolerance. The sides of the prescribed rectangles shall be parallel to one another and these rectangles shall have a common centre. For stock/standard sizes the tolerances on nominal dimensions length, *H*, and width, *B*, are ± 5 mm.

The limits of squareness shall also be described by these rectangles (see figure 2).

5.2.2 As-cut finished sizes

For dimensions less than or equal to 2000 mm, the standard tolerance range is 2 mm, to be stated as ± 1 mm of the nominal dimension.

For dimensions greater than 2000 mm, the standard tolerance range is 3 mm to be stated as ±1,5 mm of the nominal value.

The standard tolerance range to be applied shall be determined by the largest dimension of the pane.

The squareness tolerance shall be expressed as the difference in length between the diagonal dimensions of the pane.

For plates with both dimensions less than or equal to 2000 mm the difference shall not exceed 3 mm.

For plates with one (or both) dimensions greater than 2000 mm the difference shall not exceed 4 mm.

NOTE: The method of determining squareness tolerance is different from that applied to standard or stock sizes or in standards for other types of glass products.

6 Reflection characteristics of silvered mirrors

6.1 Measurement

Measurement of reflectance shall be undertaken in accordance with the principle of ISO 5740, but with the angle of incidence of the light within 10° of normal.

6.2 Silvered mirrors made from clear float glass

The regular luminous coefficient of silvered mirrors made from clear float glass shall be at least 83%.

6.3 Silvered mirrors made from tinted float glass

Silvered mirrors made from tinted float glass have a reflectance lower than those made from clear glass.

7 Quality requirements

7.1 General

The quality of a silvered mirror can be affected by faults which alter the appearance of the image of reflected objects.

Such alteration of the image can result from optical faults, faults in the glass and faults in the reflective coating.

7.2 Quality assessment and inspection methods for silvered mirrors

7.2.1 Glass, reflective coating, edge and protective coating quality

7.2.1.1 Inspection method

The silvered mirror shall be observed in a vertical position, with the naked eye and under normal diffused daylight conditions, (maximum 600 Lux at the silvered mirror), from a distance of 1000 mm. The direction of observation is normal, i.e. at right angles, to the silvered mirror. The use of an additional lighting source, e.g. spotlight, is not allowed.

7.2.1.2 Glass faults

Glass faults are assessed using the method in 7.2.1.1. The dimension and number of hairline scratches, scratches and spot faults which cause disturbance to vision shall be noted.

7.2.1.3 Reflective silver coating faults

Reflective silver coating faults are assessed using the method in 7.2.1.1. Note the presence of scratches, stains, colour spots and edge deterioration.

7.2.1.4 Edge faults

The edge quality of stock/standard or as-cut finished silvered mirrors can be affected by the presence of entrant/emergent faults and shelling. Using the method of 7.2.1.1, the edges of the silvered glass panes shall be checked for the presence of shells, corners on/off and edge vents.

7.2.1.5 Protective coating(s) faults

Using the method in 7.2.1.1, the presence of pin holes, burst bubbles, flaking of the protective coating along the edges or other faults in the protective coating(s) shall be noted.

7.2.2 Optical quality

7.2.2.1 Qualitative visual inspection method

A silvered mirror shall be examined in areas of 500 mm x 500 mm at a time. The observer shall be located at a distance of 2000 mm in front of and normal to the area being examined. Behind the observer shall be an irregular background. The reflected image shall not be optically disturbed, e.g. by another reflective surface, window etc. The observed distortions can be quantified using the method in 7.2.2.2.

7.2.2.2 Optional quantitative test method

A projector having a focus distance between 80 mm and 100 mm and an aperture of 8 mm shall be positioned at a distance of 5000 mm from the specimen being examined, at an angle of 45° to the specimen, which is positioned vertically. A screen shall be located 5000 mm from the centre of the mirror at right angles to the reflected beam (see figure 3).

A grid pattern slide, when projected onto the screen shall give dark and clear stripes of 50 mm width. Calibration of the stripe width is achieved by using a non distorted front surfaced mirror in place of the specimen.

The difference in width of each projected stripe, or of three neighbouring stripes shall be measured (see figure 4).

7.3 Acceptance levels

7.3.1 Glass faults

The acceptance level for glass faults are given in

- table 2 for stock/standard sizes;
- table 3 for as-cut finished sizes.

7.3.2 Reflective silver coating faults

Reflective silver coating faults shall not be allowed if visible under examination using the method described in 7.2.1.1.

7.3.3 Edge faults

7.3.3.1 Chips or shells

For stock/standard sizes, entrant or emergent chips or shells, visible under the conditions in 7.2.1.1, shall be accepted provided they do not exceed a maximum length and depth of 10 mm and half the nominal glass thickness (see figure 6).

For as-cut finished sizes, entrant or emergent chips or shells, visible under the conditions in 7.2.1.1, shall be accepted provided they are not greater than 1,5mm deep (see figure 7).

7.3.3.2 Corners on/off

For stock/standard sizes occasional corners on/off (see figure 8), visible under the conditions in 7.2.1.1, shall be allowed. No more than 5% of the sheets on a delivery shall be affected.

For as-cut finished sizes corners on/off shall not be allowed.

7.3.3.3 Vented (cracked) edges

Vented (cracked) edges, visible under conditions described in 7.2.1.1, shall not be allowed with either stock/standard sizes or as-cut finished sizes.

7.3.4 Protective coating(s) faults

Protective coating(s) faults shall not be allowed if visible under examination using the method described in 7.2.1.1.

Table 2: Acceptance levels for glass faults in stock/standard sizes

Linear Defects [1]	
Hairline scratches with a length ≤ 50 mm	7,2 m^2 surface area → an average of 3 defects 19,3 m^2 surface area → an average of 8 defects (0,375 defects/m^2)[4]
Scratches with a length ≤ 50 mm	7,2 m^2 surface area → an average of 1 defect 19,3 m^2 surface area → an average of 3 defects (0,139 defects/m^2)[4]
Spot faults[2]	
≤ 0,2 mm	accepted, providing they do not form a cluster
> 0,2 mm ≤ 0,3 mm	7,2 m^2 surface area → 9 defects 19,3 m^2 surface area → 24 defects (1,25 defects/m^2)[4]
providing the average over 1 pack is not more than 6 faults or 16 faults respectively[3]	
> 0,3 mm	7,2 m^2 surface area → 2 defects 19,3 m^2 surface area → 5 defects (0,278 defects/m^2)[4]

All calculations assume mathematical rounding

1) The average shall be calculated taking into account the total individual pack area (m^2).

2) The dimensions stated are without the effect of the halo and relate to the largest of the fault dimensions.

3) For mirrors with a tinted glass substrate the acceptance levels are 11 faults corresponding to a surface area of 7,2 m^2 and 29 faults corresponding to a surface area of 19,3 m^2; related to an average of 10 faults per pack and an average of 27 faults per pack respectively.

4) For other sizes the number of allowable faults shall be calculated using the ratio in brackets.

Table 3: Acceptance levels for glass faults in as-cut finished sizes

	Area	Spot faults			Surface faults	
		> 0,2 mm[1] ≤ 0,3 mm	> 0,3 mm ≤ 0,4 mm	Border Zone[2] ≥ 0,2 mm ≤ 0,8 mm	Hairline scratches ≤ 50 mm	Scratches
Mirror tiles etc.	≤ 0,3 m^2	2	1	0	2	0
Cut sizes	≤ 1,0 m^2	1	1	0	2	0
	≤ 1,5 m^2	2	1	0	2	0
	>1,5 m^2	3	2	1	3	0

[1] ≤ 0,2 mm: accepted providing they do not form a cluster

[2] The size of the border zone is determined as 15% of the edge length and width (see figure 5).

7.3.5 Optical faults

The mirror meets the requirements if it does not exhibit any disturbing optical variation of the image following the visual inspection described in 7.2.1.1.

In case of doubt, the method given in 7.2.2.2 can be used. The measured deviations shall remain within the following limits (see figure 4):

A = 50 mm - a
B = 50 mm + a
C = 150 mm - b
D = 150 mm + b

where: a = 10 mm;
b = 15 mm.

If the pane includes an original edge of the basic glass production width B, the following values for a and b apply in the corresponding 150 mm wide border band:

Nominal glass thickness < 4 mm:
a = 30 mm
b = 40 mm

Nominal glass thickness ≥ 4 mm:
a = 20 mm

b = 30 mm

8 Testing of silvered mirror

8.1 Durability

8.1.1 General

The durability of silvered mirror shall be determined by a number of tests, in accordance with the following specifications:

- NSS - Neutral salt spray test (see ISO 9227)
- CASS - Copper accelerated acetic acid salt spray test (see ISO 9227)
- Condensation water test at constant atmosphere (see normative annex A)

8.1.2 Test specimens

Silvered mirrors which are to be tested shall be stored in suitable conditions and for a sufficient period to allow backing materials to cure. Just prior to testing, the silvered mirror shall be cut to the specimen size of 100 mm x 100 mm.

8.1.3 Position of specimens

The specimens shall be placed in the testing cabinets with the protective coating (painted) side up at an angle as defined by the standards.

For the humidity and saltspray tests these specimens shall be turned through 90° every 120 h, without stopping the testing.

8.1.4 Evaluation

The specimens shall be examined in diffused daylight (maximum 600 lux at the mirror) against a black background. A magnifying glass (7x) shall be used to measure the maximum edge corrosion and spot fault diameter(s).

The determination of edge corrosion shall be carried out on:

- two vertical edges for the CASS test
- all four edges for the humidity and the salt spray tests

8.1.5 Acceptance criteria

Silvered mirror when tested in accordance with 8.1.1 to 8.1.4 shall comply with the following:

- discolouration of the protective coating surface shall be allowed.
- coloured or diffused areas shall not be allowed within the reflective layer.
- bubbles in the protective coating surface shall not be allowed.

The acceptance criteria for edge corrosion and spot faults in the reflective coating are given in table 4.

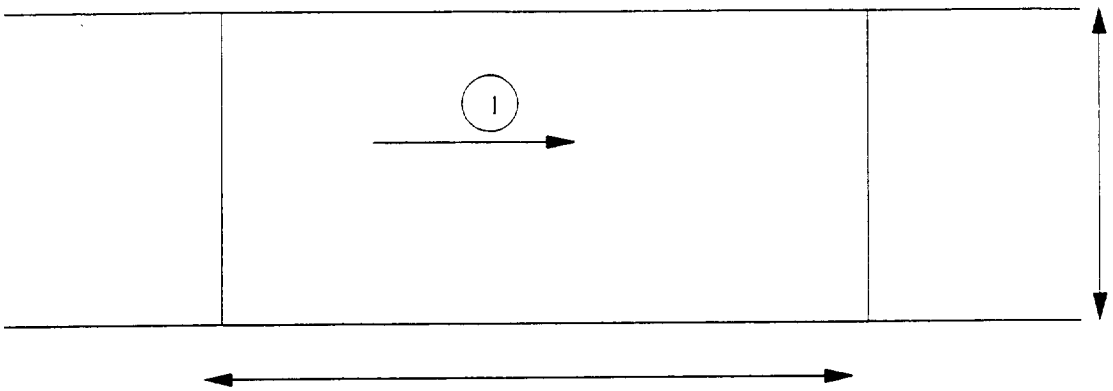
Table 4: Acceptance levels for edge corrosion and spot faults in the reflective coating after durability testing

Test type	Acceptance criteria
Neutral salt spray test according to ISO 9227	After 480 h
- edge corrosion	≤ 1,5 mm
- number of spots	2 of 0,3 mm < diameter ≤ 3 mm 5 of diameter ≤ 0,3 mm
CASS test according to ISO 9227	After 120 h
- edge corrosion	≤ 2,5 mm
- number of spots	2 of 0,3 mm < diameter ≤ 3 mm 3 of diameter ≤ 0,3 mm
Condensation water test	After 480 h
- edge corrosion	≤ 0,2 mm
- number of spots	1 of diameter ≤ 0,3 mm

8.2 Protective coating(s) adhesion

The adhesion of the protective coating(s), excluding the metallic layer, shall be assessed by means of the 'Cross cut test' given in ISO 2409. The test shall be carried out manually, using the 6 bladed cutter, with a cut spacing of 1 mm.

The results shall comply with classification number (2) according to ISO 2409.



1 Direction of draw

Figure 1: Relationship between length, width and direction of draw

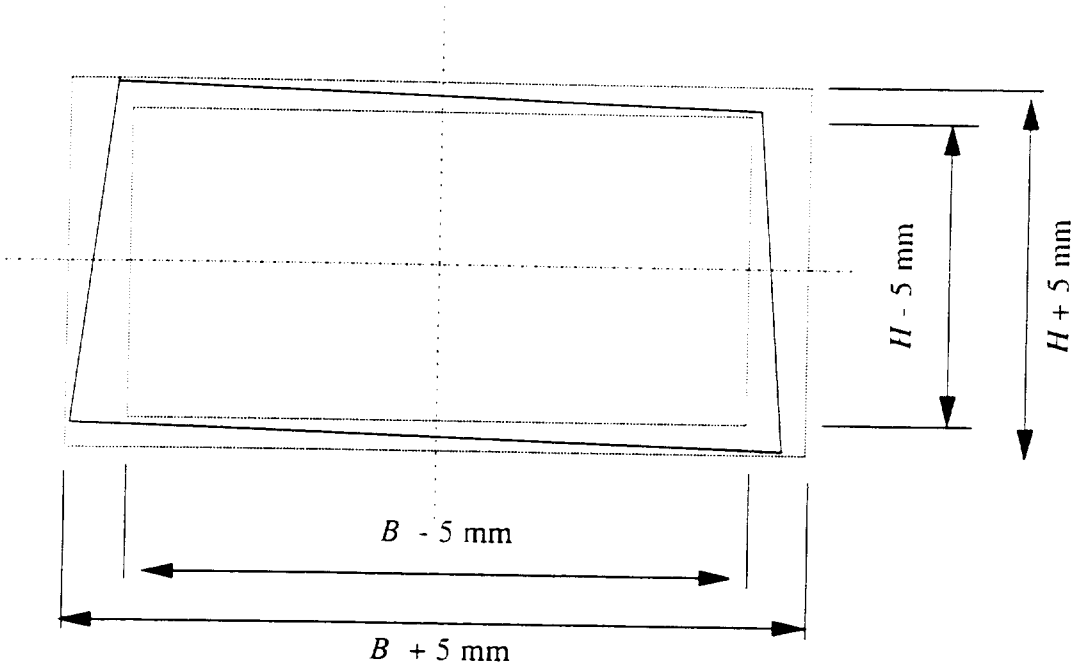
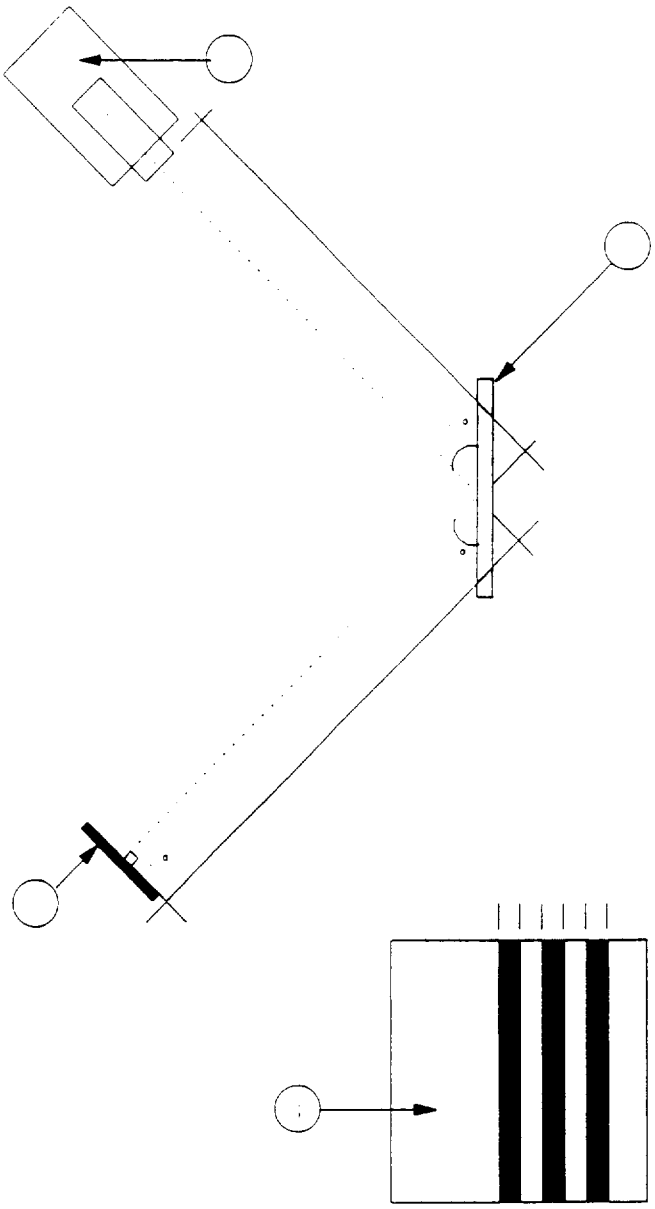


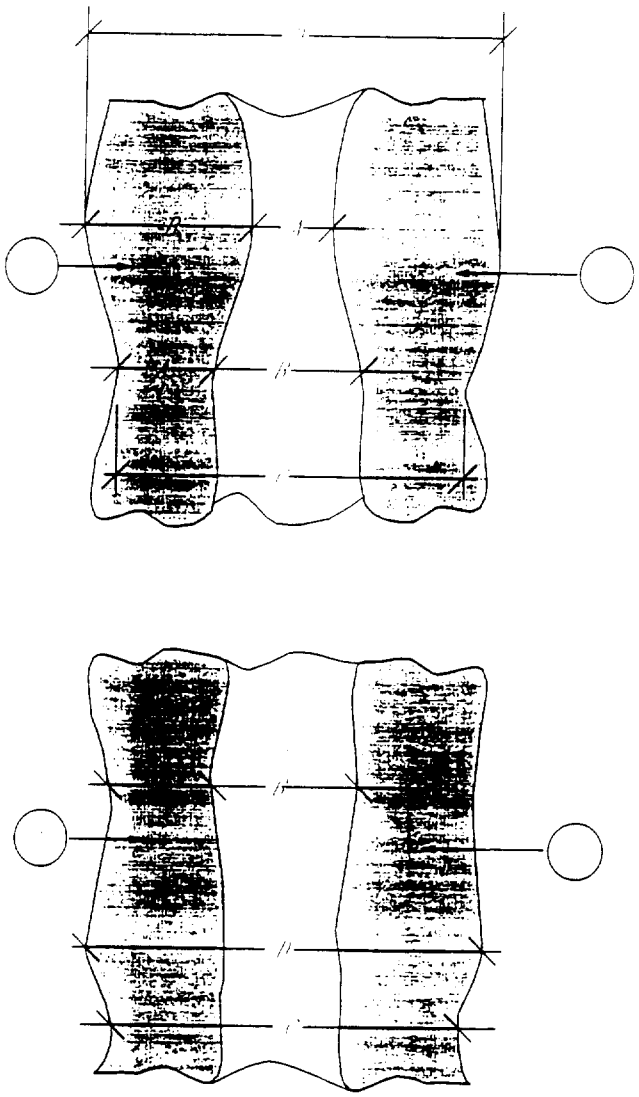
Figure 2: Determination of length, width and squareness for stock/standard sizes

Not to scale
Dimensions in millimetres



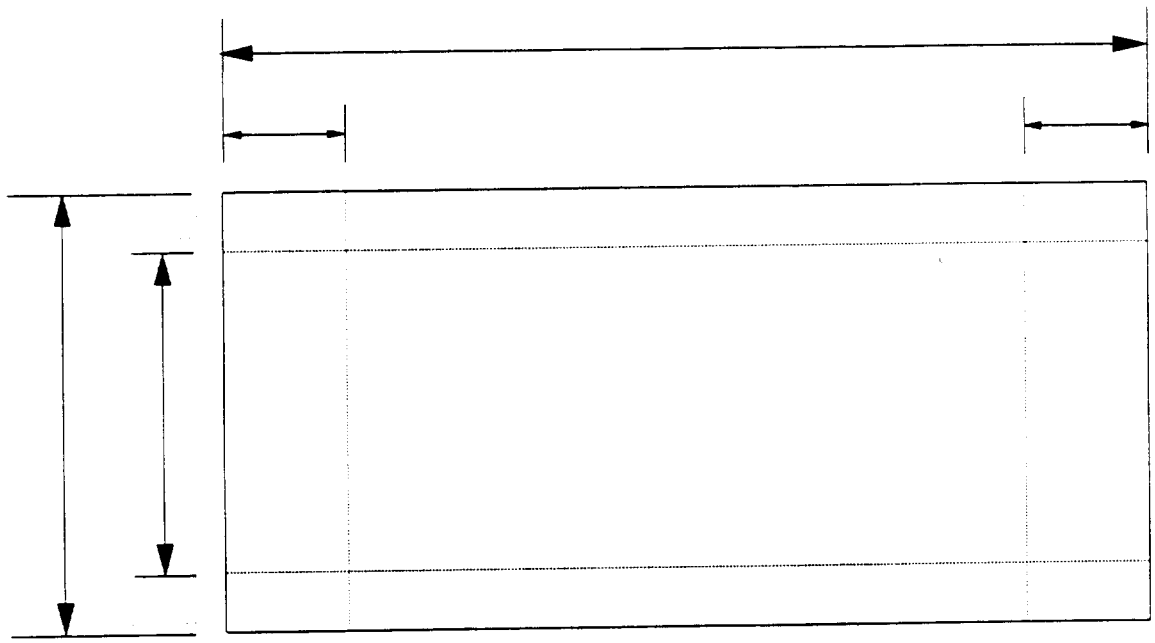
1 Projector
2 Sample
3 Screen
4 Screen image

Figure 3: Optional quantitative test method for optical quality



l Black stripe

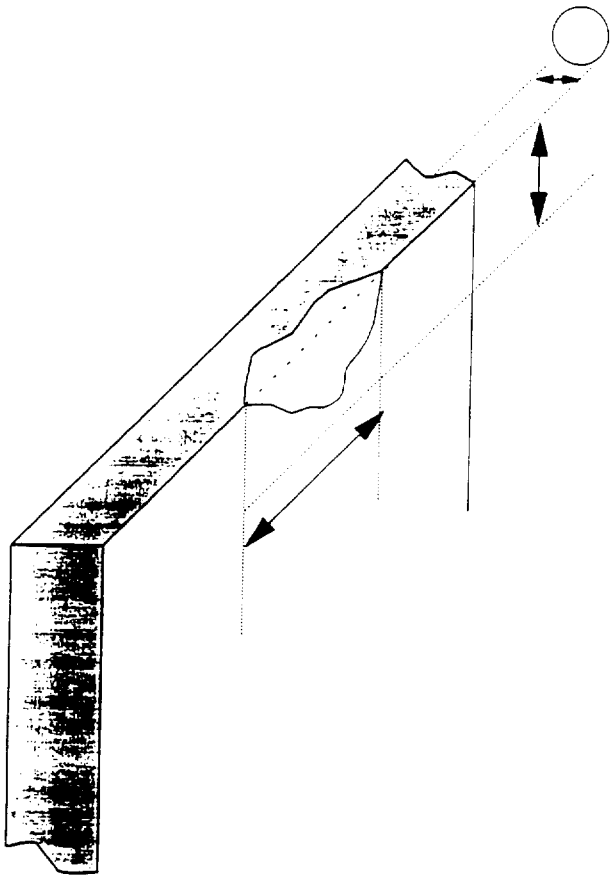
Figure 4: Assessment of optical quality



L: length
W: width

Figure 5: Border zone

Not to scale
Dimensions in millimetres



l Half nominal glass thickness

Figure 6: Edge shell dimensions for stock/standard sizes

Not to scale
Dimensions in millimetres

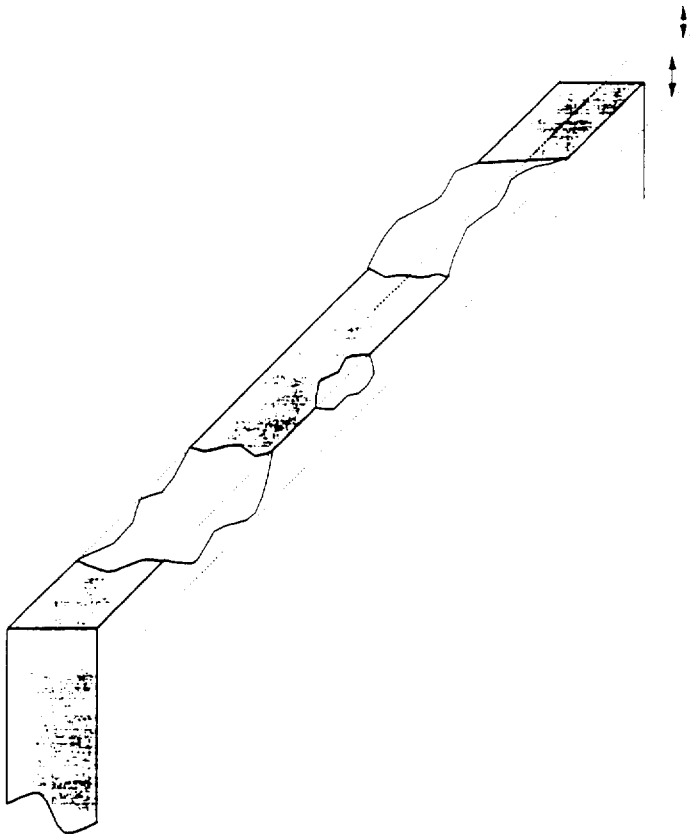


Figure 7: Edge shell dimensions for as-cut finished sizes

Not to scale
Dimensions in milimetres

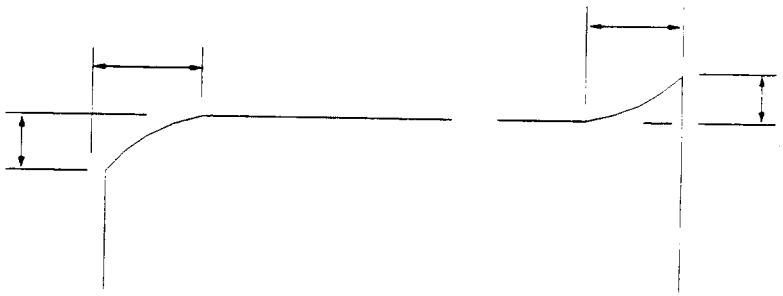


Figure 8: Dimensions of corners on/off

Annex A (normative)

Condensation water test in constant atmosphere

A.1 Purpose and scope

This test method describes the general conditions which have to be observed when submitting specimens to condensation water-constant atmospheres, in order to ensure that the results of tests carried out in different laboratories are reproducible.

The tests are designed to determine the behaviour of the specimens in humid ambient atmospheres, and to pinpoint any defects of the protection of the specimens against corrosion. The behaviour of the specimens in these test atmospheres does not, however, enable any direct assertions to be made in respect of the service life expectation of the components tested under real conditions of use.

The shape and the preparation of the specimens, the duration of the test, the evaluation of the test and the assessment of the test results do not form part of the subject matter of this test method.

A.2 Test conditions

Condensation water test atmospheres promote the condensation of atmospheric humidity on the surfaces of specimens, the temperatures of which are lower than the temperature of the saturated air in the test cabinet, due to radiation onto the cabinet walls or to the cooling of the specimen.

The constant atmospheric temperature in the test cabinet during the condensation process of the condensation water test atmospheres of this standard shall be $(40 \pm 3)\ ^{\circ}C$.

The quantity of condensation water formed on the surface of the specimen may also have an important influence on the action of the condensation water; this quantity will be affected by the ambient temperature in the installation room or by the cooling of the specimen.

The condensate which drips off the specimen consists of condensation water and also in some instances of solid and liquid constituents of the specimens dissolved in the condensation water or mixed in it.

Reproducible results can only be expected on condition that the test atmosphere is the same and that the test procedure is the same.

A.3 Climatic testing device

A.3.1 Climatic chamber

A vapour-tight climatic chamber is essential for testing with a warm and humid atmosphere. The material of the inner walls shall be corrosion-resistant and shall not affect the specimens. The climatic chamber shall be usually equipped with a floor trough which acts as the receptacle for the quantity of water prescribed in A.4.1. The test cabinet conditions shall be achieved by heating the water in the floor trough.

If the quantity of heat introduced via the water is insufficient to heat up the air in the test cabinet to the required temperature, then this air shall be heated up additionally.

> NOTE: The heating-up time will depend on the nature and quantity of the specimens, and also on the ratio of the water surface of the floor trough to the wall surface of the test cabinet, and on the water temperature.

The water temperature shall not exceed 60 °C.

The dimensions of the climatic chamber and the arrangement of its temperature measuring and control equipment can be modified, provided that the test conditions in accordance with A.2 and A.4.3 are observed and that the temperature of the test atmosphere in the useful space is measured.

The climatic chamber shall be provided with a suitable door or other aperture capable of being closed, which allows the test room to be charged with specimens and to be ventilated.

An example of a condensation water climatic testing device is illustrated in figure A.1.

Climatic testing devices not equipped with water-filled floor troughs shall be designed in such a way that an adequate formation of condensation water on the specimens is achieved in them.

A.3.2 Installation of the climatic chamber

The climatic chamber shall be installed in a room with an ambient atmosphere not containing any corrosive constituents (e.g. it shall not be installed in a chemical laboratory), at a room temperature of (23 ± 5) °C and at a relative atmospheric humidity not exceeding 75% relative humidity, in such a way that it is protected against draughts and solar radiation. In the case of comparison tests, the ambient temperature in the installation room shall be (23 ± 2) °C.

> NOTE: A decrease in the ambient temperature will result in an increase in the quantity of condensation water.

A.3.3 Device for the accommodation of the specimens (specimen holder)

The device for the accommodation of the specimens shall consist of a corrosion resistant material and shall not promote the corrosion of the specimens. It shall allow the specimens to be arranged in accordance with the requirements of A.4.3.

A.4 Procedure

A.4.1 Filling the floor trough

The floor trough shall be filled with pure water (distilled water or de-ionized water) in such a way that at least 10 mm depth of water is present at all times during operation.

A.4.2 Specimens

Only specimens which are not capable of influencing one another mutually shall be tested together at any one time.

If the amount of condensation water formed is likely to additionally affect the specimens, then the quantity of condensation water shall be ascertained over a 24-h period, with the aid of a suitable device, for the purpose of describing the test conditions (see A.4.4).

A.4.3 Arrangement of the specimens

The specimens shall be arranged in the test cabinet in such a way that they are not in close contact with each other and that they are able to radiate heat adequately.

The following minimum spacings shall be observed:

- distance from the walls — not less than 100 mm
- distance of the bottom edge of the specimens from the surface of the water — not less than 200 mm
- spacing between adjoining specimens — not less than 20 mm

Steps shall be taken to ensure that no condensation water is allowed to drip onto the specimens from the walls of the test cabinet or from other specimens arranged overhead, when the specimens are positioned.

A.4.4 Device for the determination of the comparison quantity of condensation water

The device described below is suitable for the determination of the comparison quantity of condensation water.

An 18 mm x 180 mm test tube of glass, filled with water, shall be used as the standard specimen. The condensate dripping from the test tube shall be collected in a graduated measuring cylinder with a nominal capacity of 10 ml, via a glass funnel with a diameter of 55 mm. The device shall be arranged in the test cabinet amongst the other specimens in the same way as described in A.4.3 for the arrangement of the specimens, and the bottom of the test tube (which shall itself be suspended from a thread of polyamide for example), shall be situated 50 mm above the rim of the funnel placed in the graduated measuring cylinder.

A.4.5 Test sequence

A.4.5.1 Start-up

After the specimens have been positioned and after the climatic chamber has been closed, the heating for the floor trough water or for the climatic testing device shall be switched on, and the test cabinet shall be heated up to the atmospheric temperature of (40 ± 3) °C. This temperature shall be attained within 1,5 h. Condensation water shall be formed on the specimens.

A.4.5.2 Condensation water constant atmosphere

The temperature prescribed in A.2, and therefore the condensation process, shall be maintained in thetest cabinet for the entire prescribed duration of the test.

A.4.6 End of test

The test shall be terminated after 480 h.

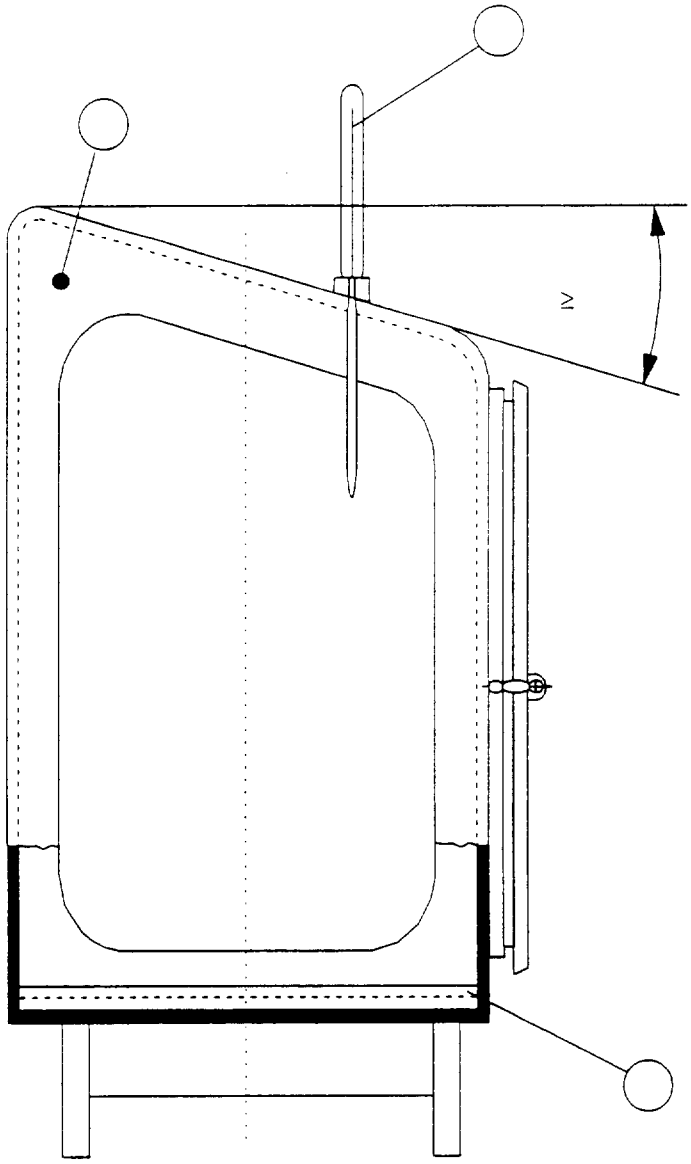
A.4.7 Interruption

Any interruptions of the test shall be recorded accurately in the test report.

A.5 Test report

The following information shall be provided in the test report quoting this standard as reference:

a) Exact description of the specimens, including their pretreatment if applicable.
b) Duration of test.
c) Reason and duration of possible test interruptions (e.g. power failure).
d) Comparison quantity of condensation water in ml/(24 h), if required in accordance with A.4.2.
e) Handling of the specimens between the end of the test and the beginning of the assessment.
f) Observations made on the test specimens after test.



1 Temperature measuring device
2 Pressure relief valve
3 Floor trough filled with water

Figure A.1: Example of a condensation water climatic testing device with glass walls

Annex B (informative)

Fixing of mirrors

B.1 General

The type of mirror and fixing should be suitable for the environment. Consideration and recognition should be given with regard to:

- durability of the coating and
- distortion free image.

For all installations, especially on ceilings the appropriate building safety and fixing regulations should be followed.

B.2 Factors affecting durability

The reflective silver layer and the protective coatings(s) of the mirror are susceptible to being damaged/corroded - this will largely depend on the environment in which the mirror is used. The following rules should always be considered:

- Between the mirror and wall or any other mounting surface air circulation should be allowed for. There should be a gap of at least 5 mm for mirrors less than 1m high or a gap of 5 mm to 10 mm for mirrors with height of more than 1m in order to ensure good ventilation.

- Where more than one mirror is fixed to the same surface, it should be ensured that there is a gap between all butting edges. As an assembly guide, a suitable 1 mm distance piece might be inserted during fixing.

- The mounting materials used should not be of an aggressive nature.

- When mirrors are inserted into profiles, the edges can be corroded by condensation, bathing lotions, cleaning chemicals etc. which may remain within the profile. To avoid this, the mirror should be mounted on small suitable blocks within the profile.

- The surface and body of the substrate material to which the mirror is to be fixed should be clean, dry, free of humidity, acid, alkali and any other aggressive materials and, when required, should be appropriate for the use of adhesives.

- Surfaces to be in contact with adhesives should be adequately prepared. For cleaning, surgical spirit can be used.

- The adhesive manufacturer's instructions should always be strictly observed.

- All adhesives used should be compatible with the mirror coating. By using the recommended adhesives for the appropriate use, mirror coating damage will be minimised.

- All adhesives, double sided tapes etc. used for fixing should be applied vertically.

- The selection and application of adhesives, along with the choice of substrate and preparation for fixing the mirror, is solely at the discretion and risk of the fixer.

- If a mirror's effect is enhanced by illumination (e.g. by spotlight), excessive warming of the mirror should be avoided to prevent deterioration of the silver, or fracture of the glass.

- When using mirrors in horse riding halls, swimming pools, medical baths, saunas and rooms adjoining them and any other rooms with constantly high humidity, no guarantee for the durability of the coating can be assumed, except for warranted mirrors specific to those applications.

B.3 Factors affecting image distortion

In order to ensure a mirror image free of distortions, the mirror should be fixed flat, stress free and in accordance with the following principles:

- Mirrors should be fixed so that the weight is not supported by the edges in order to avoid bending and thus distortion.

- When adhering a mirror to a substrate material, flatness should be ensured to avoid distortion.

- When fixing a mirror using adhesive tape, care should be taken that pressing does not cause distortion. If possible, the support base material should be adhered to the mirror (not the other way around) and subsequently the assembled mirror fixed mechanically.

- When placing several mirrors next to each other to create a mirror wall, optical breaks in the image at the joints can be positively influenced by using the adjustment tolerances of the fixing system.

- The mirror should be fixed securely but free from stress to avoid distortion and risk of breakage. Wall unevenness should be levelled by using suitable soft spacers.