International Standard 7361

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Performance standards in building — Presentation of performance levels of façades made of same-source components

Normes de performance dans le bâtiment — Présentation des performances des façades construites avec des composants de même origine

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

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Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Contents

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0 Introduction

This International Standard is one of a series of standards relating to the performance of building elements. This series comprises firstly

— Performance Standards which indicate the type of performance characterizing each family of elements — façades, partitions, roofs, cross-walls, tridimensional units — making up a building with their scales of values, if required, and which also refer to suitable methods for determining performance,

— and, secondly, International Standards applicable to each family of elements, describing the means (measurement, calculation, test method or method of examination) by which a certain performance achieved by the element is to be evaluated or verified, and/or the means of forecasting the life expectancy.

In conjunction with this series of standards, another series will also be established defining the rules pertaining to dimensional coordination and modular coordination for the different families of elements, given that they and performance are so related that some correlation is desirable.

1 Scope

This International Standard deals with façades made of prefabricated components. These are products which, when assembled according to the supplier's specifications, are intended to constitute a façade meeting the required performance levels as a complete entity.

This International Standard gives the types of performance relevant to façades, together with their scales of values, in the form in which some or all of them should be listed in the supplier's catalogue in order to allow selection of a façade achieving the overall performance required of it for the purpose of the building project in question, irrespective of type.

The façade may fulfil performance characteristics other than those specified, such as : behaviour in earthquakes, solar energy collection, etc.

This International Standard does not specify performance values; this is the task of the building designer.

2 Field of application

The façades which form the subject of this International Standard may comprise completely opaque components and components with glazed parts, either opening or fixed, provided that they all stem from one and the same supplier.

It does not, however, deal with performance specific to doors or to the opening and closing of windows, nor with the performance of internal decorative finishes (wallpaper, paint, etc.).

This International Standard does not deal with components which may be added to the façade such as guard-rails or light-excluding devices, nor with any components provided by different suppliers.[1)]

3 References

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

ISO 140/5, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 5 : Field measurements of airborne sound insulation of façade elements and façades.*

ISO 354, *Acoustics — Measurement of sound absorption in a reverberation room.*

ISO 834, *Fire-resistance tests — Elements of building construction.*

ISO 7895, *Façades — Test for resistance to positive and negative static pressure generated by wind.*[2)]

ISO 7897, *Façades — Impact resistance tests.*[2)]

1) The properties of joints between components provided by a variety of suppliers will form the subject of future International Standards.

2) At present at the stage of draft.

4 Definitions

For the purposes of this International Standard, the following definitions apply.

4.1 components from one and the same source : Components offered and provided on a contract basis by one and the same supplier.

4.2 self-supporting façades : Façades which support themselves over several storeys, only transferring their weight onto the loadbearing structure at their base.

5 Role of façade and conditions of use

5.1 Role of façade

The façade plays a role in meeting some or all of the following requirements :

a) user safety, i.e. stability, fire and intrusion safety;

b) resistance to humidity (dryness);

c) thermal comfort;

d) air purity;

e) acoustical comfort;

f) appearance;

g) tactile requirement;

h) durability;

i) ability to withstand suspended loads;

j) energy conservation;

k) work safety.

5.2 Conditions of use

The façade made of components is submitted to some or all of the following agents :

a) gravity (dead weight, climatic loads, suspended loads);

b) wind and static atmospheric pressure;

c) snow, frost;

d) rain, hail;

e) displacements of the loadbearing structure and of building elements adjacent to the façade, caused by wind, live loads, subsidence, seismic forces if appropriate, temperature and moisture changes and inherent deformation;

f) impact from the exterior and interior;

g) explosions;

h) air and road traffic noise;

i) vibrations transmitted by the ground;

j) earthquakes, if appropriate;

k) solar radiation and temperature of external air;

l) freezing;

m) thermal effects of heating of premises;

n) acidity of air and rain;

o) seaspray, if appropriate;

p) dust and sand;

q) attack from birds, insects, bacteria;

r) intrusions;

s) maintenance loads.

6 Performance

In order to perform its role in meeting user requirements indicated in 5.1, the façade made of components assembled in accordance with the supplier's instructions shall fulfil the following performance requirements.

6.1 Contribution to meeting stability requirement

6.1.1 Ability of self-support

6.1.1.1 Definition and mode of expression

Number of storeys over which the façade is able to support itself safely (self-supporting façade) or a façade which separates two construction levels at which it is fixed to the loadbearing structure.

6.1.1.2 Determination

Calculation according to any acceptable method, giving the load at the base of the self-supporting façade or on the façade fixing devices to the nearest 5 %.

6.1.2 Ability to withstand suspended loads

6.1.2.1 Definition

Ability to bear, on the exterior and/or interior, any type of load suspended by means of devices described by the supplier.

6.1.2.2 Mode of expression

Mass of permitted loads.

6.1.2.3 Determination

Test, which will form the subject of a future International Standard.

6.1.3 Resistance to wind

6.1.3.1 Definition and mode of expression

Permitted air pressure differential, in pascals, between the exterior and interior without this resulting in the collapse of the façade or in any deformation which would cause failure to meet other performance requirements.

6.1.3.2 Determination

a) Calculation according to any acceptable method, provided that errors are limited to 5 %, or

b) laboratory test : measurement of the rupture pressure differential, and of deformation occurring as a result of subjecting a section of the façade to positive and negative air pressure by means of a pressurized chamber or air cushion in accordance with ISO 7895, the façade being submitted to service loads.

6.1.4 Resistance to imposed deformation

6.1.4.1 Definition and mode of expression

Permitted displacements, in millimetres, of the points at which the façade is fixed to the loadbearing structure and to the building elements adjacent to the façade in relation to their position when the façade was erected, without this leading to the collapse or excessive deformation of the façade (maximum permitted values of deformation in service conditions are given in ISO 4356), the façade being submitted to service loads.

6.1.4.2 Determination

a) Calculation by any acceptable method, provided that errors are limited to 5 %, or

b) laboratory test with the façade being submitted to service loads; this test will form the subject of a future International Standard.

6.1.5 Resistance to safety impacts

6.1.5.1 Definition and mode of expression

Maximum impact energy, expressed in joules, which does not cause the collapse of the façade and does not endanger the safety of occupants or passers-by.

A distinction is made between external, internal and shock impacts (i.e. a series of impacts of an energy less than actual safety impacts).

6.1.5.2 Determination

Dynamic laboratory test according to ISO 7897.

Other methods for determining impact resistance based either on calculation or static tests will be the subject of future International Standards.

6.2 Contribution to meeting fire safety requirement[1)]

6.2.1 Reaction to fire

6.2.1.1 Definition and mode of expression

All properties relating to flammability, surface spread of flame along the external and internal faces, toxicity of pyrolysis and combustion products, opacity of smoke and combustibility of the façade.

6.2.1.2 Mode of expression

Classes of reaction to fire.

6.2.1.3 Determination

Laboratory test, which will form the subject of future International Standards.

6.2.2 Fire resistance

6.2.2.1 Definition and mode of expression

Time interval, expressed in multiples and sub-multiples of an hour, during which the façade's stability, thermal insulation and fire integrity are sufficient to prevent the spread of flame either through the component cavities or across the exterior of the components. (Requirements relating to stability, thermal insulation and fire integrity to be met during this interval of time are defined in ISO 834.)

6.2.2.2 Determination

Laboratory test in accordance with ISO 834, the façade being submitted to service loads.

6.3 Contribution to meeting requirements of safety against intrusion

6.3.1 Definition

Resistance offered by façade to attempts at intrusion from the exterior.

6.3.2 Mode of expression

This will form the subject of a future International Standard.

6.3.3 Determination

This will form the subject of a future International Standard.

1) In many countries, there are regulations on this subject.

6.4 Contribution to meeting requirement of resistance to humidity

6.4.1 Watertightness with respect to rainwater

6.4.1.1 Definition

Absence of penetration of rainwater which would otherwise give rise to the presence of moisture stains on the internal face, or cause damage to the façade or other parts of the building.

6.4.1.2 Mode of expression

Pressure limit of watertightness : maximum value of positive static air pressure and, if necessary, of pulsatory pressure, in pascals, at which watertightness remains assured when the façade is submitted to the test for watertightness.

6.4.1.3 Determination

Laboratory test, which will form the subject of a future International Standard.

6.4.2 Propensity to interstitial condensation

6.4.2.1 Definition

Behaviour of façade on exposure to water vapour condensation.

6.4.2.2 Mode of expression

With respect to their behaviour the façade components are classified as follows :

a) façade impermeable to water vapour from the inside (or outside) : where there exists a continuous water vapour barrier of no greater than $2{,}10^{-12}$ kg/(m^2·s·Pa) water vapour transmission which prevents the penetration of water vapour from the inside (or outside) into the component cavities;

b) façade permeable to water vapour but no likelihood of interstitial condensation taking place;

c) façade permeable to water vapour but not affected by condensation : although condensation may take place, it results in neither dripping water penetrating towards the interior nor the presence of stains on surfaces nor loss of performance or durability;

d) façade permeable to water vapour and affected by condensation, and all other cases.

6.4.2.3 Determination

a) Impermeable to water vapour : laboratory test (any method is acceptable provided that errors are limited to 10 %).

b) Likelihood of condensation : either calculation involving the permeability to water vapour of various elements constituting the façade and their thermal conductivity or a laboratory test, which will form the subject of a future International Standard.

c) Not affected by condensation : observation of actual usage or laboratory test, which will form the subject of a future International Standard.

6.5 Contribution to meeting requirements of thermal comfort and energy conservation

6.5.1 Air permeability

6.5.1.1 Definition

Quantity of air passing over a unit of surface area of a façade per unit of time at a unit of pressure difference between the outside and the inside.

6.5.1.2 Mode of expression

Rate of air leakage expressed in multiples of 0,1 m^3/(m^2·h) per 100 Pa of positive and negative pressure.

6.5.1.3 Determination

Laboratory test on a sample representative of the variety of joints and elements constituting the façade, which will form the subject of a future International Standard.

6.5.2 Thermal resistance

6.5.2.1 Definition and mode of expression

Resistance offered by the façade to the passage of heat by conduction, expressed in multiples of 0,1 m^2·K·W^{-1}.

6.5.2.2 Determination

Calculation or test, in normal conditions of humidity for the materials in use, the wind speed being 5 m/s [1].

Any acceptable method may be used provided that errors are limited to 5 % and provided that it applies to a surface area of 10 m^2 comprising the various types of joint constituting the actual façade.

1) Subject to confirmation by ISO/TC 163.

6.5.3 Transmission of solar radiation through transparent and translucent parts of the façade

6.5.3.1 Definition

Transmission of solar energy by means of radiation across the transparent or translucent parts of the façade which incorporate the components.

6.5.3.2 Mode of expression

Solar factor of transparent or translucent parts : relationship of flux of solar energy transmitted to the flux of solar energy received.

6.5.3.3 Determination

Calculation or test according to IEC Standards.

6.6 Contribution to meeting air purity requirements

6.6.1 Emission of smells by materials

6.6.1.1 Definition and mode of expression

Classes of evaluation of smells emitted by the façade in use.

6.6.1.2 Determination

Direct observation or test, which will form the subject of a future International Standard.

6.6.2 Emission of vapours, aerosols, dust and harmful radiation

6.6.2.1 Definition and mode of expression

Emission or non-emission by the façade of a harmful quantity of vapours, aerosols, dust and harmful radiation.

6.6.2.2 Determination

Test, which will form the subject of a future International Standard.

6.7 Contribution to meeting acoustical comfort requirement

6.7.1 Insulation with respect to external airborne sound

6.7.1.1 Definition and mode of expression

Sound insulation, in decibels, offered by the façade between the outside and inside as a function of the airborne sound frequency, in hertz. It is defined in ISO 140/3.

Sound insulation values are rounded to the nearest multiple of 5 dB or 5 dB + 3 dB (3, 5, 8, 10, 13, etc. dB).

6.7.1.2 Determination

Laboratory test in accordance with ISO 140/3 or field test in accordance with ISO 140/5.

6.7.2 Flanking transmission of airborne sound

6.7.2.1 Definition and mode of expression

The sound pressure level, in decibels, measured in a room, which is due to airborne sound emitted in an adjacent room and which is transmitted by the façade, expressed as a function of the frequency, in hertz. The values for sound pressure level are rounded to the nearest multiple of 5 dB or 5 dB + 3 dB (3, 5, 8, 10, 13, etc. dB).

6.7.2.2 Determination

Laboratory test, which will form the subject of a future International Standard.

6.7.3 Sound behaviour with respect to rain and hail

6.7.3.1 Definition

Level of noise emitted by the façade towards the interior and which is caused by rain and hail.

6.7.3.2 Mode of expression

Sound pressure level, in decibels, measured in a room, which is due to impact from rain and hail on the façade, expressed as a function of the frequency, in hertz. The values for sound pressure level are rounded to the nearest multiple of 5 dB or 5 dB + 3 dB (3, 5, 8, 10, 13, etc. dB).

6.7.3.3 Determination

Laboratory test or field test, which will form the subject of future International Standards.

6.7.4 Sound behaviour under effect of wind, temperature and moisture changes

6.7.4.1 Definition

Sound insulation against various noises due to wind (whistling noises, vibrations, etc.), temperature and humidity (pelting rain, etc.) on the façade.

6.7.4.2 Mode of expression

Sound pressure level, in decibels, transmitted by the façade towards the interior of a room, expressed as a function of the frequency, in hertz.

The values for sound pressure level are rounded to the nearest multiple of 5 dB or 5 dB + 3 dB (3, 5, 8, 10, 13, etc. dB).

6.7.4.3 Determination

Laboratory test or field test, which will form the subject of future International Standards.

6.7.5 Sound absorption of internal face of the façade[1)]

6.7.5.1 Definition

Property of the internal surface of the façade by which it absorbs airborne sound.

6.7.5.2 Mode of expression

Absorption coefficient (without magnitude) of the internal finished surface, expressed as a function of the frequency or airborne sound, in hertz. It is defined in ISO 354.

6.7.5.3 Determination

Laboratory test in accordance with ISO 354.

6.8 Contribution to meeting appearance requirements

6.8.1 Planeness

6.8.1.1 Definition

Planeness of the internal and external faces of the façade.

6.8.1.2 Mode of expression

a) Relative deflection : maximum deflection in relation to the straight line joining the extremities of a diagonal, expressed as a percentage of its length.

b) Skewness : distance of one of the angles from the plane defined by the three other angles, expressed as a percentage of the length of the diagonal.

c) Local planeness : maximum local deflection, expressed in millimetres over a length of 0,2 m.

6.8.1.3 Determination

Measurements taken to an accuracy of 1 %.

6.8.2 Surface condition

6.8.2.1 Definition

All properties relating to local appearance of the visible surfaces of the façade.

6.8.2.2 Mode of expression

a) Surface granularity classes.

b) Classes with respect to local faults, such as blisters, bumps, flaws, crazing, cracks, etc.

6.8.2.3 Determination

Classification, which will form the subject of a future International Standard.

6.8.3 Colour uniformity of external face

6.8.3.1 Definition and mode of expression

Limitation of unintentional variety in colour of the various elements constituting the façade.

6.8.3.2 Determination

This will form the subject of a future International Standard.

6.8.4 Specular reflection

6.8.4.1 Definition

The way in which the external face of the façade reflects light specularly.

6.8.4.2 Mode of expression

Indicatrix of diffusion or half-value angle :

a) Indicatrix of diffusion : surface extremity (or meridian curve) of segments, expressed in polar coordinates, the length of which is proportional to the luminance in this direction of the orthogonally illuminated surface.

b) Half-value angle : angle of the orthogonal to the surface of the direction in which the luminance is equal to half of the incidental orthogonal illumination.

6.8.4.3 Determination

Laboratory test in accordance with IEC Standards.

6.8.5 Ability to receive finishes

6.8.5.1 Definition

Ability of the façade to receive various internal and external finishes.

6.8.5.2 Mode of expression

List of those categories of finishes which may be used for a façade and of those which may not.

1) This performance only applies to façades the internal faces of which are supplied in their finished condition.

6.8.5.3 Determination

Test in which finishes are applied and their performance and durability verified, which will form the subject of a future International Standard.

6.9 Contribution to meeting tactile requirements

6.9.1 Definition

All those characteristics of the internal façade surface accessible to touch which influence the tactile comfort of users.

6.9.2 Mode of expression

Comparison with well-known materials.

6.9.3 Determination

Classification, which will form the subject of a future International Standard.

6.10 Contribution to meeting equipment requirements

Possible means of installing solar protection devices, light-excluding devices, means of attaching cables, fixing plates, signs, etc.

6.10.1 Definition and mode of expression

List of equipment which may be fixed onto the façade.

6.10.2 Determination

Demonstration of means of positioning the equipment listed.

6.11 Contribution to meeting durability requirements

NOTE — The performance given below is not sufficient to define durability, especially if the material with which the component is made has been in use for a relatively short period of time. Durability is dealt with in level 3 standards particular to each material.

6.11.1 Loss of performance caused by impact

6.11.1.1 Definition

Loss of planeness, deterioration in the façade surface and reduction in watertightness, airtightness and in the performance of finishes due to impact from solid bodies.

6.11.1.2 Mode of expression

Deviations in values and assignment to other classes defined in 6.4.1, 6.5.1 and 6.8, and changes in the performances of finishes, which will form the subject of future International Standards.

6.11.1.3 Determination

Dynamic laboratory tests in accordance with ISO 7897.

6.11.2 Loss of performance caused by temperature, solar radiation, rainwater, freezing and thawing

6.11.2.1 Definition

Loss of façade planeness, occurrence of stresses perpendicular to the façade due to restrained deformations, diminution of performance with respect to watertightness, airtightness, thermal resistance and performance of finishes caused by variations in temperature, solar radiation, rainwater, freezing and thawing.

6.11.2.2 Mode of expression

a) Deviations in values and assignment to other classes defined in 6.4.1, 6.5.1, 6.5.2 and 6.8.

b) Stresses due to restrained deformations of the edges of the façade components, expressed in terms of index S of rigidity under loads and index H of hygrothermal loading.

Index S is equal to the ratio of the deflection to the value of linear loading perpendicular to its plane on two or three sides of the component. Index $S2$ corresponds to a loading on two sides. Index $S3$ corresponds to a loading on three sides. Index H of hygrothermal loading is the ratio of the maximum deflection due to hygrothermal deformation to index S.

c) Deviations of performance of finishes, which will form the subject of future International Standards.

6.11.2.3 Determination

Laboratory test, which will form the subject of future International Standards.

6.11.3 Loss of performance caused by seaspray, industrial atmosphere and wind-borne sand and dust

6.11.3.1 Definition

Diminution of certain performance levels, especially of watertightness and appearance, as a result of corrosion due to seaspray and industrial atmospheres or as a result of wear due to wind-borne sand and dust.

6.11.3.2 Mode of expression

Probable duration of usability in atmospheres classed as incursive, or under classified winds.

6.11.3.3 Determination

Observation of actual use or laboratory test, which will form the subject of future International Standards.

6.11.4 Loss of performance caused by splashing water in damp rooms, flooding or condensation

6.11.4.1 Definition

Loss of planeness, watertightness, airtightness, and thermal comfort of the façade, and loss of performance of finishes due to spraying the internal face of the façade, flooding the floor of damp rooms or condensation.[1)]

6.11.4.2 Mode of expression

a) Deviations in values defined in 6.4.1, 6.5.1, 6.5.2, 6.5.3 and 6.8.1.

b) Classes of stains and rings due to humidity, which will form the subject of a future International Standard.

6.11.4.3 Determination

Laboratory test : Measurement of deviations and classification of effects on finishes :

— after spraying with water, which will form the subject of future International Standards,

— after letting the façade stand in 10 mm of water at floor level for 1 h, the façade being installed in conditions similar to conditions of actual use,

— after performing a condensation test, which will be the subject of a future International Standard.

6.11.5 Non-emission of corrosive or staining liquids which could affect other construction elements

6.11.5.1 Definition and mode of expression

Emission or non-emission.

6.11.5.2 Determination

Test, which will form the subject of a future International Standard.

6.12 Contribution to meeting erection and handling requirements

6.12.1 Transportability of the components

6.12.1.1 Mass

6.12.1.1.1 Definition and mode of expression

Mass of a component (or of a set of components if these are intended to be transported as a package), expressed in kilograms.

6.12.1.1.2 Determination

Any method, provided that errors are limited to 1 %.

6.12.1.2 Bulkiness

6.12.1.2.1 Definition and mode of expression

Overall length, width and thickness of a component (or of a set of components if these are intended to be transported as a package), expressed in metres, rounded to the next highest 0,005 m and indicated in the order above.

6.12.1.2.2 Determination

Measurement of dimensions to the nearest 5 mm.

6.12.2 Suitability for storage

6.12.2.1 Definition and mode of expression

Classes of suitability for storage with respect to a component (or to a set of components if these are intended to be transported as a package), together with its packaging, if such is intended :

a) class I : shall be stored in a room with controlled temperature and humidity;

b) class II : shall be stored under weather-proof conditions;

c) class III : may be stored in the open.

6.12.2.2 Determination

Declaration by the supplier based on experience showing that the component's performance does not alter when stored in conditions of actual use as indicated by the supplier.

6.12.3 Suitability for erection

6.12.3.1 Definition and mode of expression

The range of maximum and minimum number of hours necessary for the erection of a façade component, allocated in accordance with each skill or trade and a list of machinery, tools and other necessary equipment.

6.12.3.2 Determination

Test according to the supplier's instructions.

6.12.4 Ease of maintenance

6.12.4.1 Definition

Indication of the measures necessary to maintain the façade in a state as near as possible to its new condition.

1) Losses of performance which are only due to the presence of moisture without material deterioration are defined in 6.4.2.