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# International Standard



# 7728

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

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## Typical horizontal joints between an external wall of prefabricated ordinary concrete components and a concrete floor — Properties, characteristics and classification criteria

*Assemblages horizontaux courants entre une façade en composants préfabriqués en béton ordinaire et un plancher en béton — Propriétés, caractéristiques et éléments de la classification*

First edition — 1985-11-01

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UDC 624.078.3

Ref. No. ISO 7728-1985 (E)

Descriptors : buildings, walls, floor, joints, characteristics, water-tightness.

## Foreword

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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.

International Standard ISO 7728 was prepared by Technical Committee ISO/TC 59, *Building construction*.

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# Typical horizontal joints between an external wall of prefabricated ordinary concrete components and a concrete floor — Properties, characteristics and classification criteria

## 0 Introduction

This International Standard describes for designers a convention for jointing an external wall made of ordinary prefabricated concrete components and a concrete floor.

This convention refers, as often as possible, to standardized methods for the determination of the properties of the joint. However, methods have still not been elaborated for some of these properties, in particular for watertightness. Because of the fundamental importance of this property, a solution is proposed, by way of an example, that experience and laboratory studies have shown to be satisfactory under the usual conditions. This solution is not the only possibility, however.

## 1 Scope

This International Standard specifies the properties and characteristics of typical horizontal joints between two prefabricated ordinary concrete external wall components and a concrete floor.<sup>1)</sup>

However, the characteristics of joints which are involved in the structural behaviour of buildings are not specified in this International Standard.

## 2 Field of application

This International Standard is applicable to all public or private buildings, used as dwellings, offices, educational or hospital premises.<sup>2)</sup>

## 3 References

ISO 140/4, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 4: Field measurements of airborne sound insulation between rooms.*

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

ISO 2444, *Joints in building — Vocabulary.*

ISO 2445, *Joints in building — Fundamental principles for design.*

ISO 3447, *Joints in building — General check-list of joint functions.*

ISO 6511, *Building construction — Modular coordination — Modular floor plane for vertical dimensions.*

ISO 6589, *Joints in building — Method of test for air-permeability of joints.*

ISO 7729, *Typical vertical joints between two prefabricated ordinary concrete external wall components — Properties, characteristics and classification criteria.*

## 4 Definitions

For the purposes of this International Standard, the definitions given in ISO 2444, together with the following, apply.

**4.1 loadbearing external wall:** External wall, the role of which in the stability of the building is to transmit wholly or partly the floor loads to the foundations.

**4.2 selfsupporting external wall:** External wall, which transmits to the foundations the loads corresponding to its own weight over the whole height of the building but does not support the floors.

**4.3 supported external wall:** External wall, the weight of which is transmitted floor by floor to the loadbearing structure of the building.

1) The joints belong, therefore, to both the external wall and the floor. Thus, they participate in the separation between the two internal spaces on each side of the floor and in the separation between the internal and external environments.

2) The field of application can be extended to buildings for industrial use if the essential or optional character of some of the properties specified in clause 5 are modified.

## 5 Properties of joints and agents to which they are exposed

### 5.1 Properties

#### 5.1.1 Necessary properties<sup>1)</sup>

- a) To limit thermal losses (between the internal and external environments).
- b) To limit sound transmission (between the spaces separated by the floor).
- c) To provide satisfactory resistance to air penetration.
- d) To ensure water- and snowtightness (between the exterior and interior and, for water and other liquids, between the spaces separated by the floor).<sup>2)</sup>
- e) To prevent the passage of light (between spaces separated by the floor).
- f) The joints should not emit odours (odours emitted by jointing products).
- g) Condensation of water vapour should not occur opposite the joints and in the joints on the internal face of the wall.
- h) To resist stresses in one or more directions due to the transmission of static or dynamic forces in the wall and between the floor and the wall (forces inherent to the function of the wall and floor in the stability of the construction), by impacts and vibrations of various origins, by dimensional variations and deformations of materials, components and parts of the construction (shrinkage or expansion, creep, thermal dilation or contraction, etc.).
- j) To prevent the passage of flames, smoke and gases, between the spaces separated by the floor.
- k) The joints should not generate gases or toxic fumes in the event of fire (for the part of the joints in contact with or in the vicinity of the internal environment).
- m) To be of and to maintain an acceptable appearance on both external and internal sides.
- n) To have a service life of a specified minimum duration and, in particular, to withstand
  - reasonably foreseeable damage caused by human beings;
  - the action of animals (mammals, birds, insects, etc.);

- the action of plants and micro-organisms;
- the action of water, water vapour or aqueous solutions and suspensions;
- the action of air and wind;
- the action of various physico-chemical environmental agents (acids, alkalis, oils, greases, solvents, etc.);
- the action of dust;
- the action of light and radiation;
- the action of freezing;
- the action of variations of temperature and humidity;
- the action of extreme temperatures;
- the action of airborne or structure-borne vibrations;
- abrasive action (when the jointed components are affected by important variations of sizes allowed by the joint).
- p) To allow maintenance of the jointing material, the durability of which depends upon that maintenance.
- q) To allow replacement of degradable jointing materials.
- r) To accommodate deviations in dimensions of the joint due to deviations in the dimensions and position of the jointed components.

#### 5.1.2 Optional properties

- a) To limit thermal transmission between the spaces separated by the floor (when one of the spaces can be considered as belonging to the external environment, for example unheated attic or sanitation spaces).
- b) To limit sound transmission between the external and internal environments (when there are requirements for acoustical insulation of the internal environment with regard to the external environment).
- c) To prevent the ingress of animals, birds and insects, plants, dust, organic and inorganic particles (in general this function is fulfilled if the joint limits air penetration satisfactorily).
- d) To avoid emission of sound or noise (in the case of joints in which an air column could become resonant when excited by the wind).

1) Some of the properties mentioned are effective only if, in the wall, the joints correspond really to the design. In particular, it is essential that the edges of the components do not suffer any deterioration significantly modifying the geometry of the joints.

2) Tightness to liquids between superposed premises depends on the floor covering and its fittings. The role of the joint is to avoid altering the efficiency of the floor covering or to act as a correction.

## 5.2 Agents to which joints are exposed

The joints are exposed to the following agents:

- forces from various origins (gravity, wind, vibrations, transmission of forces, etc.);
- variations of temperature and humidity of the internal and external environments between specified limits;
- noises from air- and surface traffic and noises from neighbouring premises;
- rain, snow and ice;
- solar radiation;
- agents contained in external and internal environments;
- mammals, birds, insects and micro-organisms.

## 6 Characteristics of joints<sup>1)</sup>

The characteristics of joints affecting the necessary properties of joints are as follows.

### 6.1 Thermal transmission between internal and external environments

Methods of calculation and of measurement of the corresponding losses will form the subject of a future International Standard. They are expressed as the lineal thermal transmittance of the joint, in watts per metre kelvin (to the nearest  $0,05 \text{ W m}^{-1} \text{ K}^{-1}$ ).

### 6.2 Influence of joint on acoustical insulation of the floor

The influence of the joint is not measured directly. It is only possible to evaluate the insulation between the spaces separated by the floor containing the joint. The measurement is carried out in accordance with ISO 140/4. The result is evaluated according to ISO 717/1 and is expressed in decibels.

### 6.3 Air permeability of joints (between either external and internal environments, or spaces separated by the floor)

The air permeability of joints is measured in accordance with ISO 6589. For a given pressure expressed in pascals<sup>2)</sup>, the air permeability of joints is expressed in cubic metres per hour per metre.

## 6.4 Watertightness (given by way of an example, see figure 1)

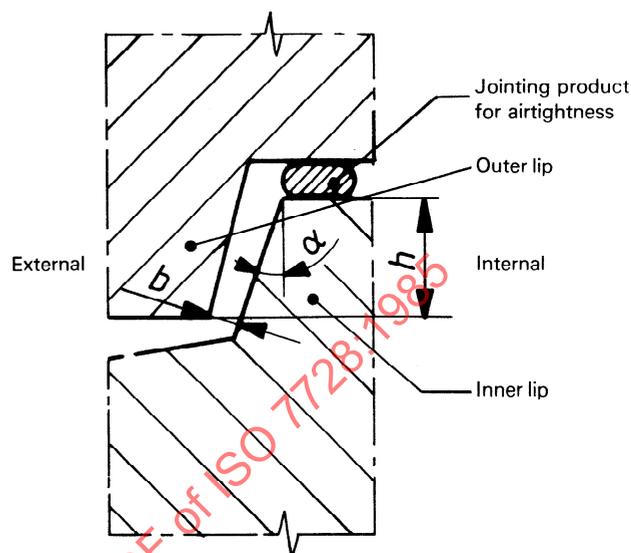


Figure 1 — Cross-section of a horizontal joint

Joints which prevent the passage of air by means of jointing products will prevent the passage of water by means of the overlap of the inner lip (lower component) with the outer lip (upper component)<sup>3)</sup> by virtue of the following minimum provisions.

#### 6.4.1 Overlap

The height,  $h$ , of the overlapping outer lip on the inner lip shall be at least 50 mm.

#### 6.4.2 Capillary break

Between the outer lip and the inner lip, there is a capillary break which drains to the exterior. Within the limits of the tolerances for the relative positions of the components, the width,  $b$ , of this break shall be greater than 5 mm. The surfaces bounding the break form an angle with the vertical,  $\alpha$ , which shall be greater than  $0^\circ$  and less than  $20^\circ$ .

#### 6.4.3 Slope at foot of inner lip

Below the capillary break, the upper surface of the lower component shall slope outwards.

1) Many of the characteristics mentioned depend not only on the joint itself, but also on the constitution of the components in the vicinity of their edges.

2)  $1 \text{ Pa} = 1 \text{ N/m}^2$

3) This outer shoulder lip may be made of a durable material other than concrete. In this case, it should be sealed in the concrete or fixed by a system, such as clips, ensuring tightness between the outer lip and the concrete.

#### 6.4.4 Airtightness

The jointing material which makes the junction airtight is located in the upper part of the joint. For a pressure of 1 Pa, the air permeability of the joint shall not exceed 0,2 m<sup>3</sup>/h/m.

#### 6.5 Water vapour condensation

6.5.1 On the internal face of the wall and/or floor in the vicinity of the joint (see figure 2, points A).

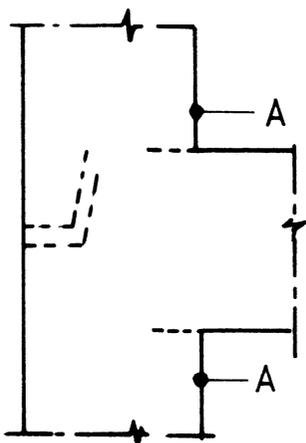


Figure 2 — Water vapour condensation points

An indication of the risk of condensation can be obtained from the superficial temperature factor,  $\mu$ , given by the formula

$$\mu = \frac{T_i - \theta_{i \min}}{T_i - T_e}$$

where

$T_i$  is the internal ambient temperature;

$T_e$  is the external ambient temperature;

$\theta_{i \min}$  is the lowest surface temperature on the internal face of the wall, near the joint.

#### 6.5.2 Inside the joints

No method is given for evaluating the risk of water vapour condensation inside the joints.<sup>1)</sup>

1) If necessary, this can be evaluated by calculation; the corresponding risk is appreciated by means of the statement of the location of the condensation zone in the joint, and the rate of condensation for defined conditions of temperature and relative humidity of the external and internal environments. This method is rarely applicable, however, with sufficient accuracy.

#### 6.6 Transmission of forces

##### 6.6.1 Loadbearing or selfsupporting wall or bracing wall

The characteristics of joints involved in the transmission of forces by loadbearing, selfsupporting or bracing external walls will form the subject of other International Standards.

##### 6.6.2 Supported external wall

For the connection between the external wall and the floor, if it exists, the characteristics of resistance and deformability under static and dynamic forces, or impacts applied from the various directions may be determined either in accordance with 6.6.1 or a future International Standard dealing with the mechanical characteristics of fittings.

#### 6.7 Fire resistance

A method for determining fire resistance of the floor, including the joint with the external wall, will form the subject of a future International Standard.

Fire resistance is expressed in hours and fractions of hours.

#### 6.8 Emission of gases or toxic fumes in the event of fire

Measurement of the toxicity of pyrolysis and combustion products, together with the opacity of smoke emitted by products in the event of an internal fire, will form the subject of future International Standards.

#### 6.9 Internal and external appearance

No criteria are given for evaluating the initial appearance of the joints.

The risk of modification of the appearance by thermal degradation can be evaluated by means of the thermal heterogeneity coefficient,  $\varrho$ , which is given by the formula

$$\varrho = \frac{T_i - \theta_{i \min}}{T_i - \theta_{i \max}}$$

where

$T_i$  is the internal ambient temperature;

$\theta_{i \min}$  is the lowest surface temperature of the internal face of the external wall near the joint;

$\theta_{i \max}$  is the surface temperature of the typical internal face of the external wall.