

# INTERNATIONAL STANDARD

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**9933**

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**AMENDMENT 1**  
2004-09-15

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## **Products in fibre-reinforced cement — Long corrugated or asymmetrical section sheets and fittings for roofing and cladding —**

### **AMENDMENT 1**

*Produits en ciment renforcé par des fibres — Plaques ondulées ou  
nervurées longues et leurs accessoires pour couvertures et  
revêtements —*

**AMENDEMENT 1**



Reference number  
ISO 9933:1995/Amd.1:2004(E)

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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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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.

Amendment 1 to ISO 9933:1995 was prepared by Technical Committee ISO/TC 77, *Products in fibre reinforced cement*.



# Products in fibre-reinforced cement — Long corrugated or asymmetrical section sheets and fittings for roofing and cladding —

## AMENDMENT 1

### Page 2, Clause 4

The following designations have been changed:

- $L_1$  Upper estimation at 95 % confidence level of the result  $M_1$  in the warm water test and in the soak dry test.
- $L_s$  Lower estimation at 95 % confidence level of the result  $M_2$  in the warm water test and in the soak dry test.
- $M_1$  Average value of the test result of the control specimen of the first lot for the warm water test and the soak dry test.
- $M_2$  Average value of the test result of the specimens after the warm water test and the soak dry test.

### Page 7

Add a new subclause, 5.4.3.6

#### 5.4.3.6 Soak dry

When tested as specified in 5.5.9.6, any visible cracks, delaminations or other defects in the sheets shall not be of such a degree as to affect their performance in use. The specimens shall exhibit a ratio  $L$  as defined in 5.5.9.6.4 of not less than 0,70. This is equivalent to a decrease in load of no more than 15 % when the coefficient of variation is 15 %.

### Page 7

Add a new subclause, 5.4.4

#### 5.4.4 Reaction to fire

The details of the specifications and acceptance criteria of reaction to fire may be defined by national standards.

### Page 7, subclause 5.5.1

Replace the text by:

#### 5.5.1 Acceptance tests

The following acceptance tests shall be carried out at the manufacturer's works on sheets as-delivered, the maturity of which is guaranteed by the manufacturer.

Sampling levels and acceptance criteria shall be defined by national standards. In the absence of national documents, the sampling levels and acceptance criteria shall be as defined in ISO 390, and the minimum value of any parameter shall be subject to an AQL of 4 %.

Page 7, subclause 5.5.2

Replace the text by:

### 5.5.2 Type-tests

A type-test is concerned with the approval of a new product and/or a fundamental change in formulation and/or method of manufacture, the effects of which cannot be predicted on the basis of former experience.

The test shall be performed on the as-delivered product.

The test is required to demonstrate conformity of a generic product to a specification but is not required for each production batch.

When type-tests are carried out, the product shall also be subjected to the acceptance tests to ensure that it complies with the requirements of this International Standard.

These type-tests are

- a) mechanical characteristics: deflection (compulsory), see 5.5.8;
- b) impermeability (compulsory), see 5.5.9.1;
- c) frost resistance (optional), see 5.5.9.2;
- d) warm water (optional), see 5.5.9.4;
- e) heat-rain (compulsory), see 5.5.9.5;
- f) soak dry (optional), see 5.5.9.6.

Page 8, subclause 5.5.4.3

Replace the text by:

### 5.5.4.3 Procedure

Lay the sheet flat on the surface as shown in Figure 3, ensuring that the valley of every corrugation is in contact with it.

To measure the length, take three measurements: one in the middle and one approximately 50 mm from each side or further to avoid mitred corners (see Figure 3).

To measure the width, take three measurements: one in the middle and one approximately 50 mm from each side or further to avoid mitred corners (see Figure 3).

Any other measurement method with an equal or greater accuracy may be used.

Page 11, subclause 5.5.2.1

Replace the text by:

**5.5.5.2.1 Micrometer**, with hemicylindrical plates as shown in Figure 6, accurate to 0,05 mm. Other measurement devices giving an accuracy equal or higher may be used.

Page 13, subclause 5.5.8.3

Replace the text by:

### 5.5.8.3 Procedure

The determination of mechanical properties shall be carried out on preconditioned specimens in ambient or wet conditions or as specified by national standards.

In the absence of national standards, type testing shall be carried out on wet preconditioned specimens.

Condition specimens in accordance with Table 4.

**Table 4 — Conditioning**

Test	Conditioning
Acceptance test, wet	24 h $\pm$ 1 h immersion in water
Acceptance test, ambient	24 h to 72 h in ambient laboratory conditions
Type test	Prior to the bending test, 7 d $\pm$ 1 d in ambient laboratory conditions followed by 24 h immersion in water

The specimen is placed on the supports (the smooth face in compression) at right angles with the corrugations and loaded at midspan by the flat beam evenly distributing the load applied to its centre, after interposition of the strips of felt or soft material.

The breaking load (3.6) shall occur between 10 s and 45 s after the beginning of loading.

Measure the deflection at midspan under 20 % and 70 % of the load which specifies the class.

Page 16, subclause 5.5.9.5.1

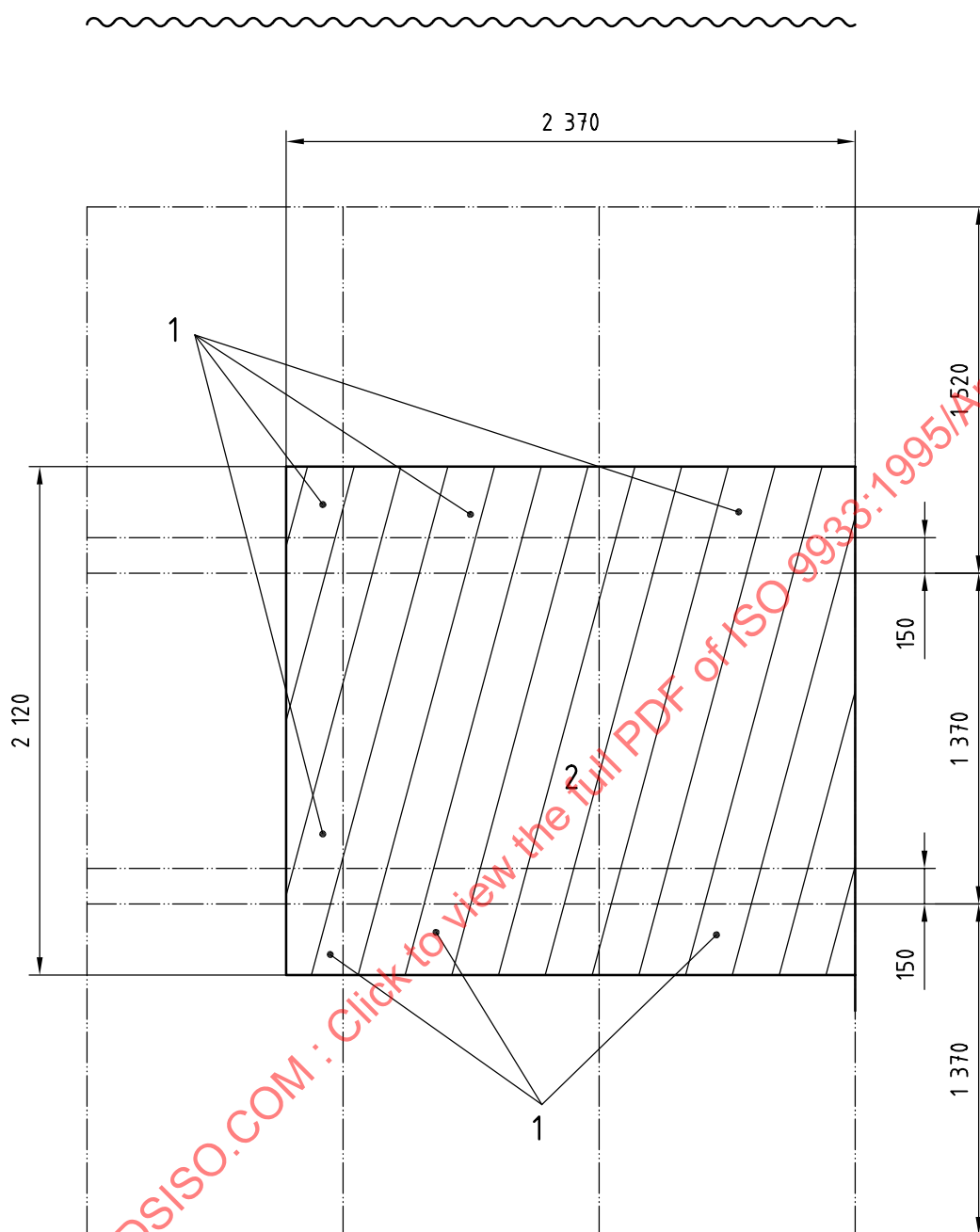
Replace the text by the following and add Figure 11.

### 5.5.9.5.1 Preparation of specimens

The test specimens shall be prepared from 9 sheets. The effective area submitted to the heat rain test shall be between 3 m<sup>2</sup> and 5 m<sup>2</sup>. At least 2 full size sheets, laid in order to provide full side and end overlaps, shall be tested. Suitable cut sections of sheets shall be used as starters to realize at least 1 side lap and 2 end laps of the 2 full size tested sheets (see Figure 11).

Sheets longer than 2,50 m shall be cut down to 2,50 m and shall not be tested with end laps.

Dimensions in millimetres



**Key**

- 1 starters
- 2 effective testing area

**Figure 11 — Example of 9 long sheets 177 mm × 51 mm (length 1 520 mm) with 150 mm overlap**



Page 17, subclause 5.5.9.5.2.1

Replace the text by:

**5.5.9.5.2.1 A vertical suitable frame**, for testing both façade and roofing products.

For roofing products only, national standards may specify another inclination of the frame.

Page 17, subclause 5.5.9.5.2.2

Replace the text by:

**5.5.9.5.2.2 A heating device**, calibrated in order to maintain a black body<sup>3)</sup> surface temperature of  $60\text{ °C} \pm 5\text{ °C}$  for façades and of  $70\text{ °C} \pm 5\text{ °C}$  for roofs on the surface at the crown of the corrugation. It should provide an approximately uniform power output during the whole heating period.

The heating device should be capable of attaining the specified surface temperature within 15 min.

Page 17, subclause 5.5.9.5.2.3

Replace the text by:

**5.5.9.5.2.3 A water-sprinkling device**, with an output of approximately:

— 1,0 l/min/m<sup>2</sup> for façades,

— 2,5 l/min/m<sup>2</sup> for roofs,

delivering water at an ambient temperature higher than 5 °C.

Page 17

Add a new subclause, 5.5.9.6

## **5.5.9.6 Soak dry**

### **5.5.9.6.1 Preparation of the specimens**

Cut 20 specimens longitudinally from the central axis of a complete sheet involving 2 corrugations or, if the sheet is too narrow, one complete corrugation is acceptable. Longitudinal cutting shall be carried out from the axis of the valley with a minimum supplementary edge of 20 mm.

Specimens may be transversally cut to a length allowing a free span  $\times 15$  the height of the corrugations.

### **5.5.9.6.2 Apparatus**

**5.5.9.6.2.1 Ventilated oven**, capable of attaining a temperature of  $60\text{ °C} \pm 5\text{ °C}$  and a relative humidity less than 20 % with a full load of specimens within 6 h.

**5.5.9.6.2.2 Water bath**, filled with water at an ambient temperature greater than 5 °C.

**5.5.9.6.2.3 Bending test machine**, as specified in 5.5.8.2.

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3) For the definition of a blackbody see ASTM E 638-78. For this test an aluminium plate of 1 mm thickness painted with a matt black paint is used as a blackbody.

The measurement device is a thermocouple or a similar device fixed on the surface of the aluminium plate.

#### 5.5.9.6.3 Procedure

Divide the specimens into two lots of 10.

Submit one lot of 10 specimens to the breaking load test in accordance with 5.5.8. and, at the same time begin to submit the second lot of specimens to soak-dry cycles consisting of:

- immersion in water at ambient temperature for 18 h;
- drying in a ventilated oven at  $60\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$  and a relative humidity less than 20 % for 6 h.

If necessary, an interval up to 72 h between cycles shall be defined by the national standard specifying the test. In default, the total number of cycles shall be 25.

#### 5.5.9.6.4 Expression and interpretation of results

For each of the two lots, calculate the mean breaking load and the standard deviation of the values obtained.

Let  $M_1$  and  $s_1$  be the mean breaking load and the standard deviation of the results obtained on the first lot, and  $M_2$  and  $s_2$  be the mean breaking load and the standard deviation of the results obtained on the second lot tested after soak-dry cycles.

Calculations:

- the lower estimation of the mean breaking load after soak-dry cycles at 95 % confidence level:

- $L_S = M_2 - 0,58S_2$

- the upper estimation of the mean breaking load at 95 % confidence level of the reference lot:

- $L_1 = M_1 + 0,58S_1$

- the 95 % lower confidence limit

- $L = L_1/L_S$

The results shall be compared with the requirements of 5.4.3.6.

The results are considered to be satisfactory if they conform to the requirements.

Page 18, subclause 71

Replace the text by:

### 7.1 Conformity with requirements

The manufacturer shall establish and maintain an effective documented quality control system developed for instance on the basis of the standards of the series ISO 9000.

For the acceptance tests, 90 % of the delivered products shall fulfil the requirements of 5.4.1.2, 5.4.1.5, 5.4.2.1 and 5.4.3.3.

In the absence of national documents, the sampling schemes provided in ISO 390 with an AQL of 4 % and an inspection level  $S_3$  ensures that for continuous series of large batches, approximately 90 % of the items fulfil the requirements. Other methods may be used provided they ensure the same level of quality.

Page 18, subclause 7.2

Replace the text by:

## **7.2 Evidence of conformity of consignment of finished products**

When tenders and/or orders specify receiving inspection, the lots delivered are presumed to be in conformity with this International Standard.

Inspection of a consignment of finished products should take place only where there is no third-party certification. It is conducted, e.g., in accordance with ISO 390, which gives an AQL of 4 % with an inspection level  $S_3$ , and in accordance with Annex A.

For special applications, different levels of quality may be applied after agreement between manufacturer and purchaser.

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