BRITISH STANDARD

BS EN
15057:2006

Fibre cement profiled sheets — Impact resistance test method

The European Standard EN 15057:2006 has the status of a British Standard

ICS 91.100.40

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 15057:2006.

The UK participation in its preparation was entrusted by Technical Committee B/542, Roofing and cladding products for discontinuous laying, to Subcommittee B/542/4, Fibre-reinforced cement sheeting for roofing, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;

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A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 18, an inside back cover and a back cover.

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English Version

Fibre cement profiled sheets - Impact resistance test method

Plaques profilées en fibres ciment - Méthode d'essai de résistance au choc

Faserzement-Wellplatten - Schlagfestigkeitsprüfung

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Foreword

This document (EN 15057:2006) has been prepared by Technical Committee CEN/TC 128 “Roof covering products for discontinuous laying and products for wall cladding”, the secretariat of which is held by IBN/BIN.

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of an identical text or by endorsement, at the latest by December 2006, and conflicting national standards shall be withdrawn at the latest by December 2006.

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Introduction

Different fibre-cement profiled sheets on the market incorporate additional features to contribute to security during construction of the roof.

Fibre-cement profiled sheets have been evaluated for impact resistance by a number of national methods, designed to simulate the impact of accidental falling on the roof.

The results from the different existing methods are not directly comparable.

This European Standard establishes an agreed method for evaluation of impact resistance of fibre-cement profiled sheet products, based on the experiences obtained over the last number of years in different countries.

This is a product standard with no classifications, but this test procedure with different drop heights or number of drops may be used by national regulators to set classifications for roof assemblies.

The performance of a roof constructed with these products depends not only on the property of the product as required by this European Standard, but also on the design, construction and performance of the roof as a whole in relation to the environment and conditions of use.

1 Scope

This European Standard specifies a soft body impact test method for fibre-cement profiled sheets for roofing.

This European Standard applies to fibre-cement profiled sheets conforming to EN 494 and of length greater than or equal to 1,04 m.

It applies only to products as delivered.

NOTE This European Standard can be applied, after agreement between manufacturer and purchaser, to curved sheets.

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.

EN 494:2004, *Fibre-cement profiled sheets and fittings — Product specification and test methods*

ISO 7892, *Vertical building elements — Impact resistance tests — Impact bodies and general test procedures*

3 Terms and definitions

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

3.1
profiled sheet
component the cross section of which consists of corrugations as defined in 3.1 of EN 494:2004

3.2
type test
test carried out to demonstrate conformity with the requirements of this European Standard or for approval of a new product and/or when a fundamental change is made in formulation and/or method of manufacture the effects of which cannot be predicted on the basis of previous experience. The test is performed on the delivered product, but is not required for each production batch

3.3
as delivered
same condition as the producer intends to supply the product after completing all aspects of the process including maturing and, when appropriate, painting

3.4
span
distance between the parallel support axes

3.5
lap (overlap)
amount one sheet overlaps another at either the end (end lap) or the side (side lap)

4 Symbols and abbreviations

For the purpose of this document, the following symbols and abbreviations apply.

E Impact energy in joules

h Impact height in metres

m Mass of the soft body impactor in kilograms

g Acceleration due to gravity in metres per second squared

w_1 Weight of specimen in grams

w_2 Weight of dried specimen in grams

IPN I Beam Profiles Normales

IPE I Beam Profiles European

5 Product requirements

5.1 Composition

Fibre cement profiled sheets shall have a composition according to 5.1.1 of EN 494:2004.

5.2 Appearance and finish

Shall be as defined in 5.1.2 of EN 494:2004.

5.3 Criteria for compliance

When tested in accordance with 7.6 the sheets shall meet the following criteria:

— the sheet under test shall arrest the fall of the impactor and retain it on the test assembly for a period of at least 60 s.

— compliance is required by 8 out of 8 sheets. If 1 of the 8 sheets fails, a further 8 sheets shall be tested with a compliance requirement of 8 out of 8 sheets passing the test.

6 Sampling procedure

6.1 Sampling method

Take an adequate number of full size sheets (16 or 24) drawn at random from a consignment of at least 151 sheets or, in case of continuous production, from a production batch. All sheets used on the test assembly shall be from the same consignment or production batch. The size of the production batch is chosen by the manufacturer up to a maximum of one week's production. If 1 sample out of 8 fails in the first test, the samples for retest are taken in the same manner.

6.2 Type testing

The impact resistance test is a type test and shall be performed to demonstrate conformity to this European Standard.

For continuous production the type test shall be repeated at least once every year.

7 Test method for the determination of soft body impact resistance

7.1 Principle

The soft body impact resistance is determined by dropping a 50kg spheroconical bag with no initial speed from a height of 1200mm perpendiculary into the centre of the mid sheet of a given test assembly (see Figure 2) and measuring the time for which the bag is retained by the same sheet.

NOTE This creates an impact energy which is in excess of the impact energy released by a person falling from a standing position.

7.2 Test apparatus

The apparatus consists of:

a) A frame (see Figure 2) of minimum height 600 mm, made of IPN or IPE 140 bars reinforced by U braces of height 50 mm. These shall be either welded or screwed.

— Minimum length of the frame: 3 000 mm.

— Width of the frame: 1 300 mm, measured at the inside of the IPN or IPE 140.

This frame shall be placed on a flat, solid surface.

b) Supports (see Figure 3) made of 4 IPN or IPE 100 bars of minimum length 1 430 mm. Two steel plates of 200 mm x 60 mm x 10 mm are welded on at each end. The supports are either welded or screwed into position parallel to each other using bolts M 10 x 30. The upper face of the supports shall be in a horizontal plane with a tolerance of ± 1 mm.

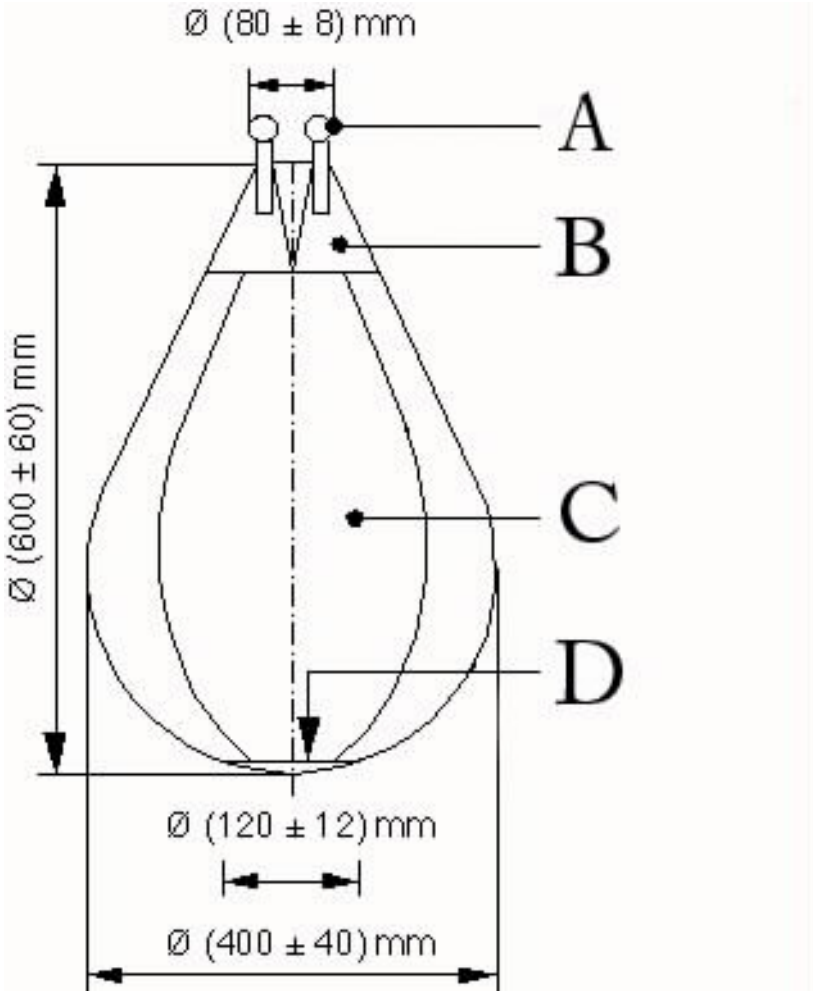
c) A spheroconical canvas or leather bag of diameter (400 ± 40) mm (see Figure 1 and ISO 7892) filled with (3,0 ± 0,3) mm diameter glass spheres to give a total weight of (50 ± 0,5) kg as the soft body impactor.

d) A system for the instant release of the bag without application of initial energy.

e) Hooks of the dimensions described in Figure 4 with a characteristic resistance of 2300 N. The hooks will be fitted with a washer as described in Figure 7.

f) A measuring rod of (1 200 ± 2) mm to measure the distance *h* between the base of the bag and the crown of the corrugation of the sheets to be tested.

g) A torque spanner for adjusting the fittings.

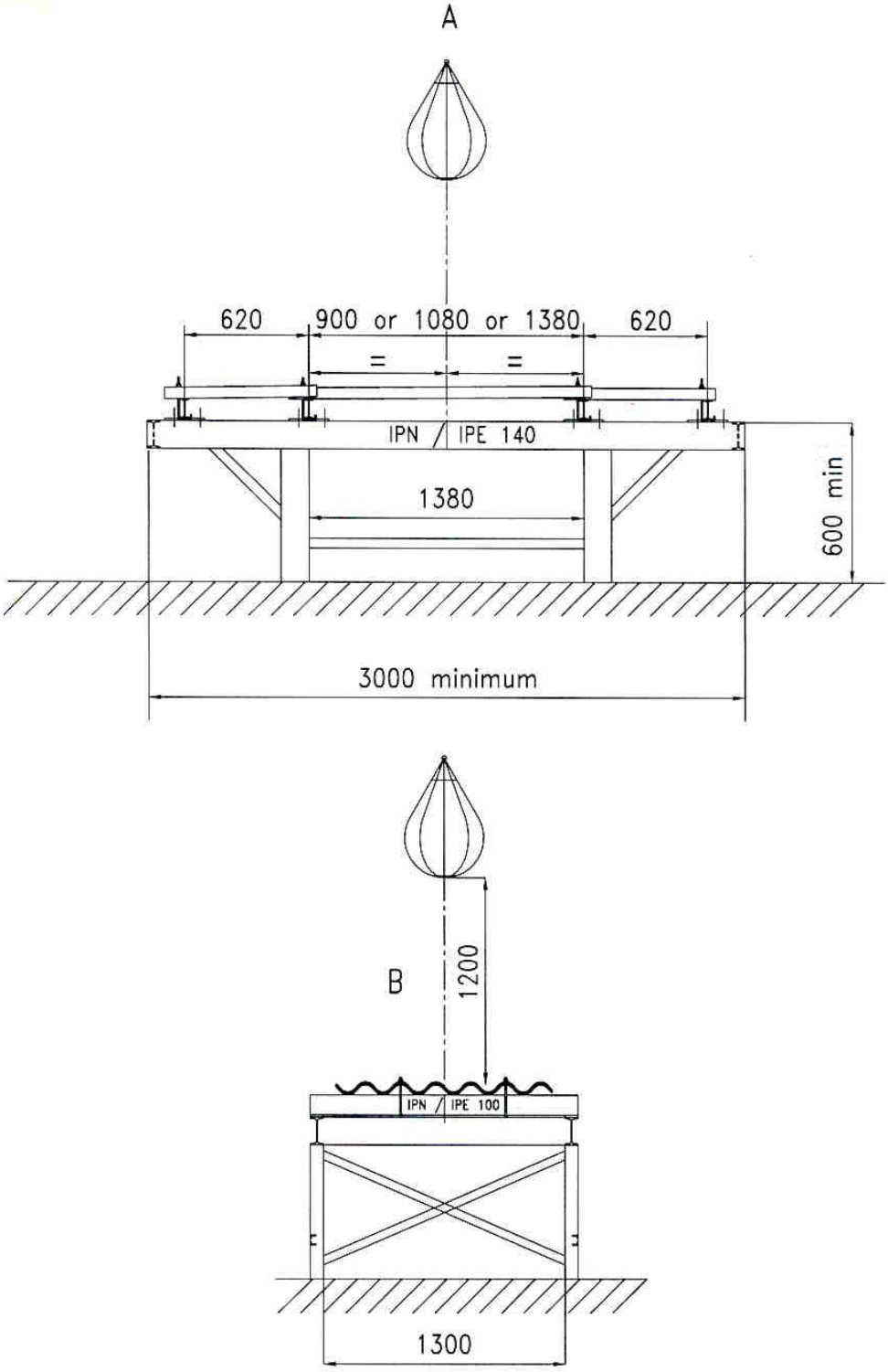


Key

A suspension ring (or rings)
B leather strip
C 8 canvas sections
D leather bottom

Figure 1 — Spheroconical bag

Dimensions in millimetres



Key

A mid span

B mid sheet

Figure 2 — Frame – front and side view

Dimensions in millimetres

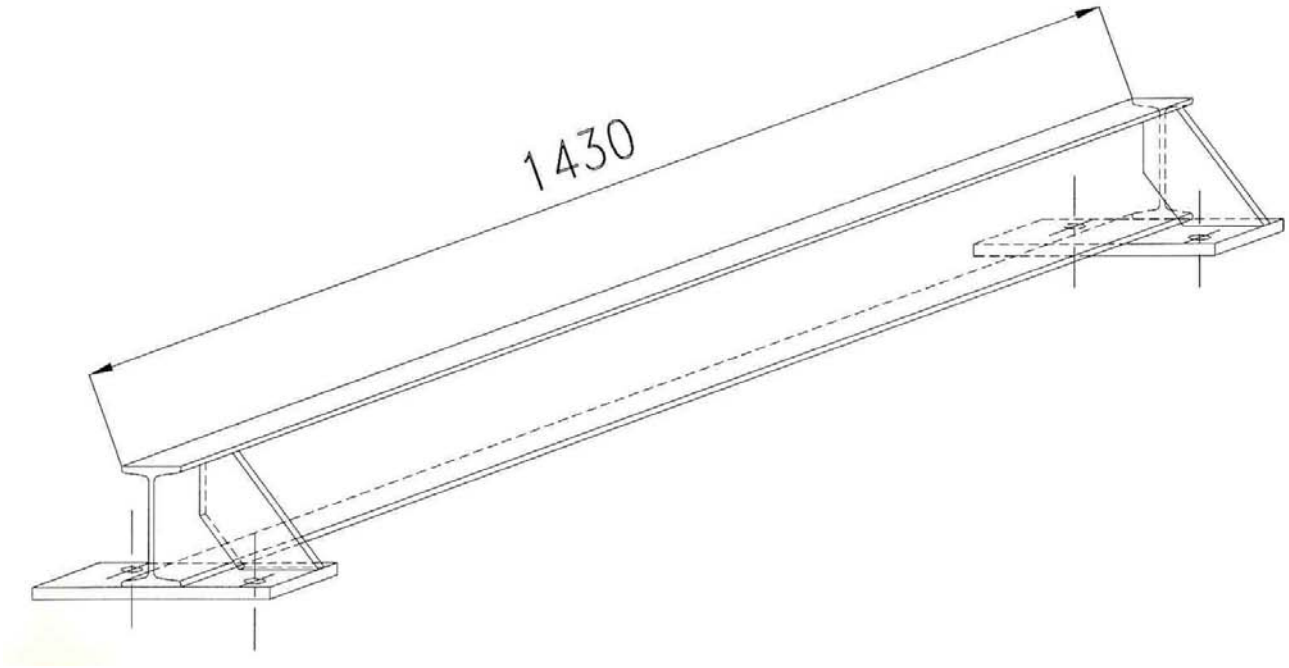
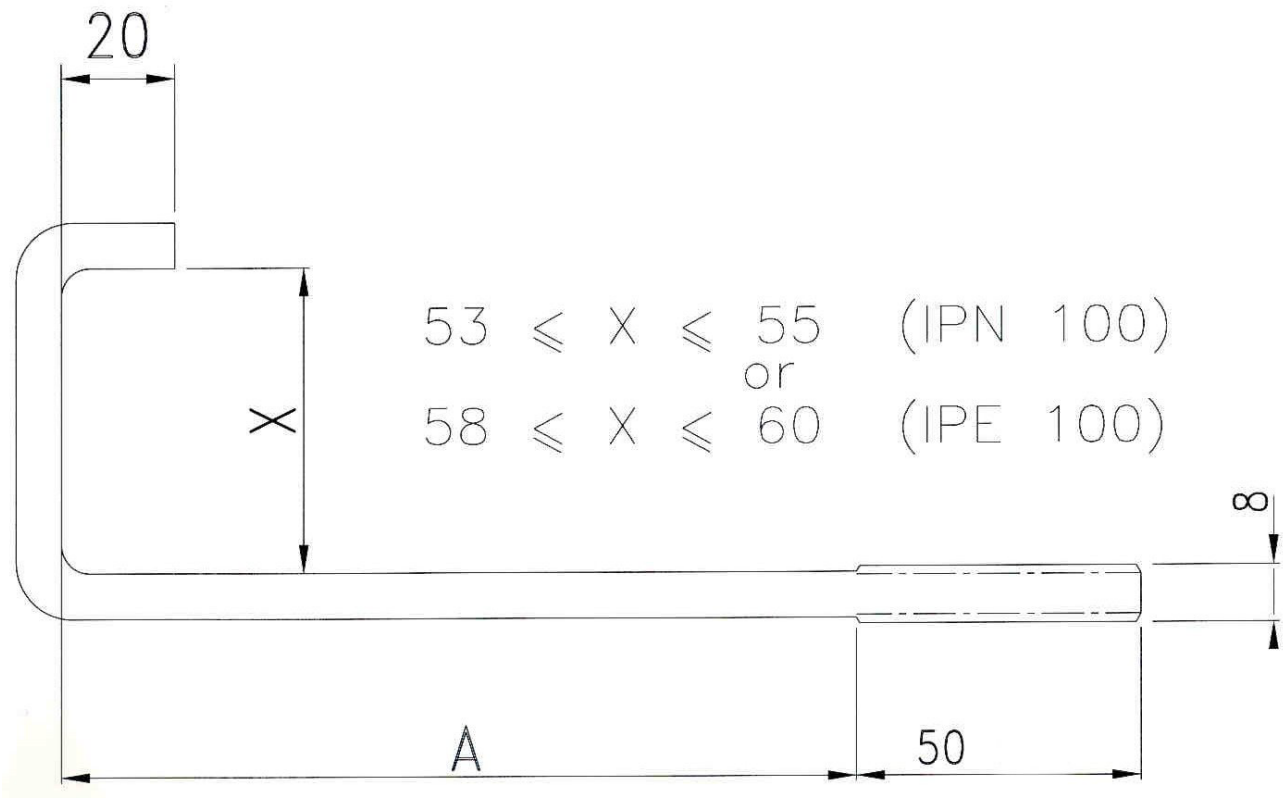


Figure 3 — IPN or IPE 100 bar

Dimensions in millimetres

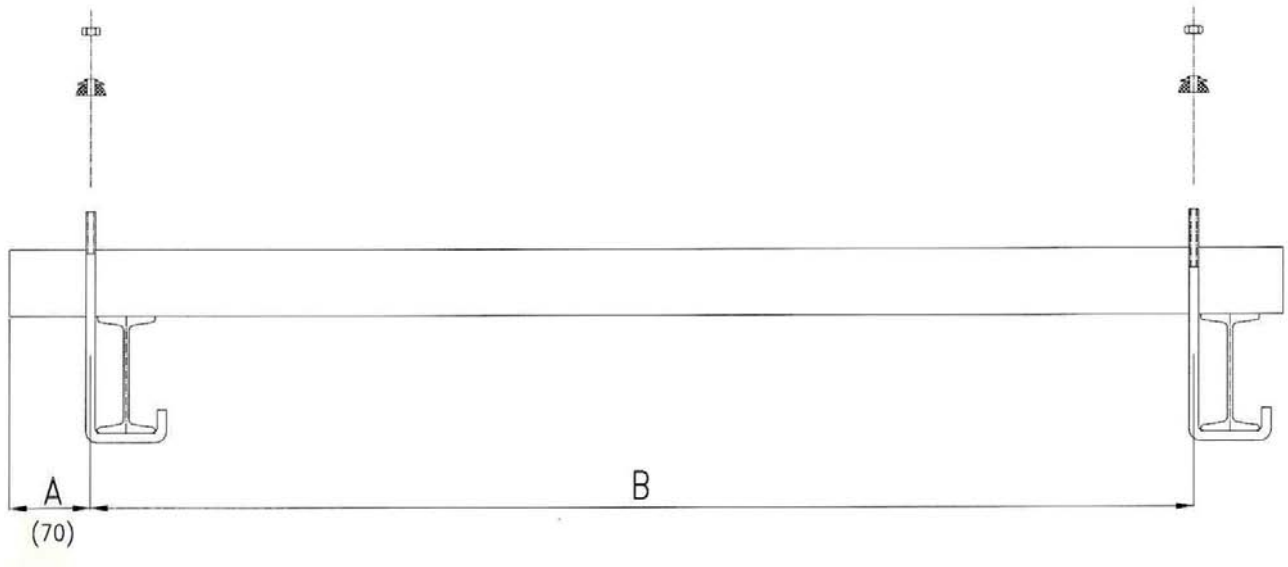


Key

A 90 mm + height of corrugation of the sheet

Figure 4 — Hook bolt

Dimensions in millimetres



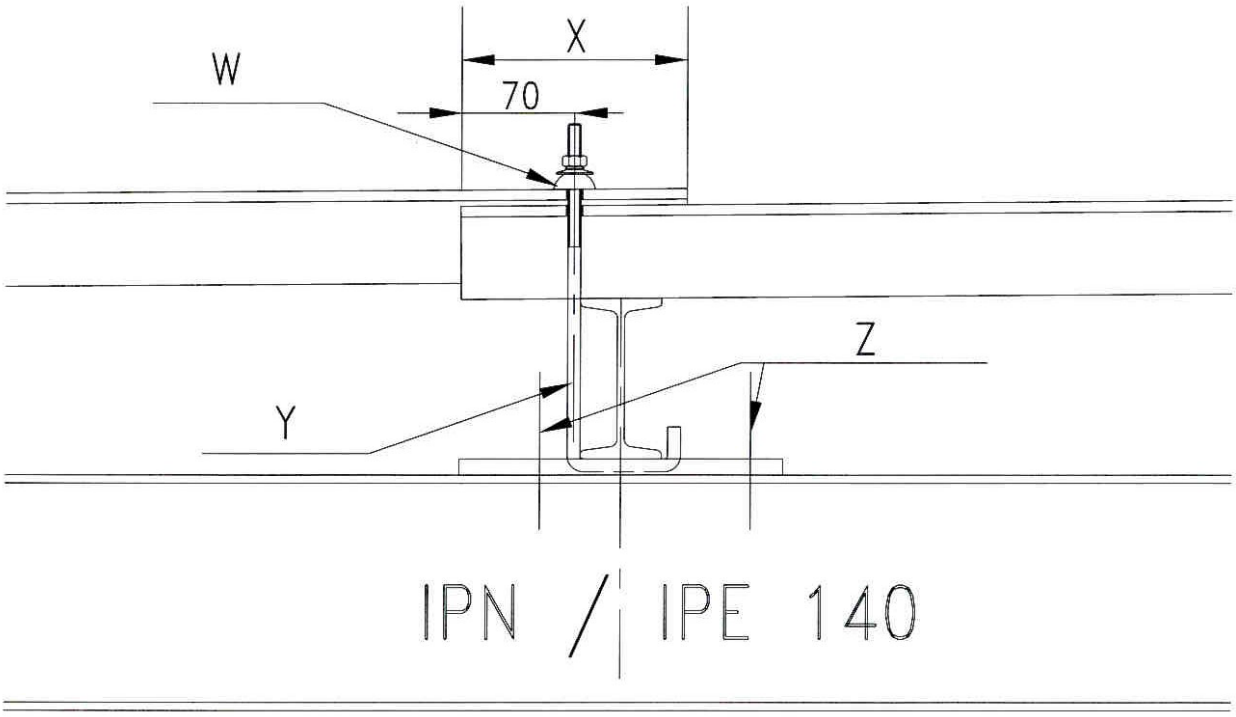
Key

A see Table 3

B see Table 3

Figure 5 — Fixing positions of the specimen

Dimensions in millimetres



Key

W washer
X overlap of 140 mm
Y hook bolt diameter 8 mm
Z bolts M 10 x 30 mm

Figure 6 — Positioning of the sheets

Dimensions in millimetres

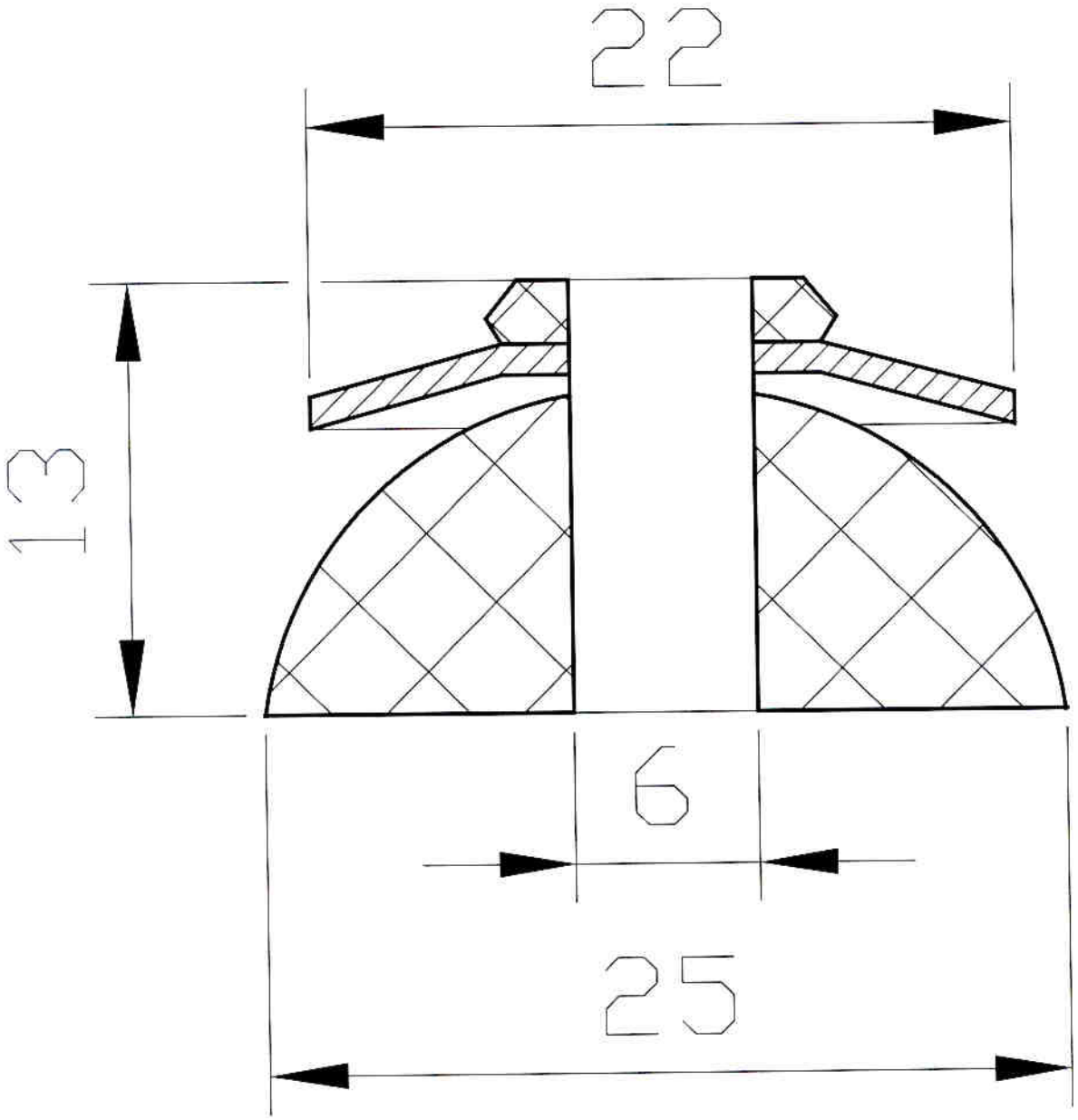


Figure 7 — Washer

7.3 Number of tests

The test shall be carried out on the test assembly described in 7.5 and shall consist of 1 impact per sheet length. 8 tests are required with a new assembly for each of the tests. The length of the overlap and underlap sheets shall be (760 ± 10) mm.

The point of impact shall be in the centre at mid span (see Figure 2).

The relevant sheet length span and overlap are given in Table 1.

Table 1 — Sheet length, overlap and span

Sheet length (mm)	Overlap (mm) nominal value	Span (mm)
1 040	140	900
1 220	140	1 080
1 520	140	1 380

The specimens should be tested with one of the above values, or at the maximum allowed by code of practice or recommended by the manufacturer.

The tolerance for each of the dimensions in Table 1 is ± 10 mm for the sheet length and ± 2 mm for the span.

7.4 Moisture content of the test specimens

The specimens to be tested shall have an average moisture content in the range of 8 % to 16 %.

7.5 Test assembly

Fix the IPN/IPE 100 bars (see Figure 3) on the frame according to the relevant span (see Table 1).

The sheets are drilled to a diameter of 9 mm at positions A and B (see Figure 5) according to both the length and number of corrugations, as specified in Tables 2 and 3.

Table 2 — Location of fixings

Number of corrugations of the fibre-cement sheets	Position of the fixings
8 corrugations	2^{nd} and 6^{th} corrugation
7 corrugations	2^{nd} and 4^{th} corrugation or 2^{nd} and 6^{th} corrugation
6 corrugations	2^{nd} and 5^{th} corrugation
5 corrugations	2^{nd} and 5^{th} corrugation
4 corrugations	2^{nd} and 4^{th} corrugation

Table 3 — Fixing positions of the specimen

Sheet length (mm)	A (mm)	B (mm)
1 040	70	900
1 220	70	1 080
1 520	70	1 380

The tolerance for A and B is ± 2 mm.

The sheets shall have two fixings at each end, at the top of the corrugations as specified in Tables 2 and 3.

The sheets shall be fixed symmetrically with respect to the longitudinal axis of the frame and with the crowns of the corrugations perpendicular to the IPN bars (see Figures 5 and 6).

Fix the sheets to the IPN bars at each location using hooks and washers as defined in 7.2.

The overlap and underlap sheets are fixed in the same way.

The screws of the hooks are then tightened with the torque spanner applying a moment of 1,5 Nm.

The vertical axis of the bag is positioned at the centre of the sheet at midspan (see Figure 2).

The bag is raised and reformed in the spheroconical shape defined by ISO 7892 so that its base hangs at 1 200 mm from the crown of the corrugation.

Check the drop height using the measuring rod.

The bag is released with no initial speed.

The specimen, hooks and washers shall not be used in more than one test.

7.6 Test procedure

7.6.1 Determination of impact resistance

A soft body impactor of mass m is dropped from a height h on to the test specimen. The total impact energy *E* can be calculated by the following equation:

$$E = g \times m \times h$$

where

E is the impact energy (Joules);

m is the mass of the soft body impactor (kg);

g is the acceleration due to gravity (9,81 m/s²);

h height (m) between the point of impact, at the top of the corrugation, and the bottom of the spheroconical bag.

7.6.2 Determination of moisture content

From each corrugated sheet which has been tested a piece of at least 100 cm² is taken, weighed to the nearest 0,01 g and put into a ventilated oven at 105° C for 24 h. After cooling to room temperature the piece is weighed again to the nearest 0,01 g.

The moisture content is calculated as follows:

$$\text{Moisture content (\%)} = \frac{w_1 - w_2}{w_1} \times 100$$

where

w_1 weight of specimen (g);

w_2 weight of dried specimen (g).

8 Test report

The test report shall contain the following information:

— reference to this European Standard, i.e. EN 15057;

— the name of the testing laboratory;

— the date of the test;

— identification of the sheets tested with respect to dimensions and markings according to EN 494;

— the moisture content of the sheets as calculated in 7.6.2;

— results for all sheets tested including the span and the drop height and indicating pass or fail.

Bibliography

[1] ACR(M)001:2000, Test For Fragility of Roofing Assemblies (second edition)

[2] ISO 2859–1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

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