BRITISH STANDARD

BS EN
1463-2:2000
Incorporating
Corrigendum No. 1

Road marking materials — Retroreflecting road studs —

Part 2: Road test performance specifications

The European Standard EN 1463-2:2000 has the status of a British Standard

ICS 93.080.20

National foreword

This British Standard is the official English language version of EN 1463-2:2000. Together with BS 8442:2006, BS EN 12899-1:2001 and BS EN 1463-1:1998, this British Standard supersedes BS 873-1:1983, BS 873-2:1984, BS 873-4:1987, BS 873-5:1983, BS 873-6:1983 and BS 873-7:1984 which are withdrawn.

The UK participation in its preparation was entrusted by Technical Committee B/509, Road equipment, to Subcommittee B/509/2, Horizontal road markings and road studs, which has the responsibility to:

— aid enquirers to understand the text;

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

— monitor related international and European developments and promulgate them in the UK.

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

This standard is the second part of a two part standard for road studs prepared by CEN. This standard partially supersedes BS 873-4 which has been declared obsolescent.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard, having been prepared under the direction of the Sector Committee for Building and Civil Engineering, was published under the authority of the Standards Committee and comes into effect on 15 May 2000

ISBN 0 580 34020 1

Amendments issued since publication

Amd. No.	Date	Comments
16772 Corrigendum No. 1	31 October 2006	Correction to supersession details

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1463-2

January 2000

ICS 93.080.20

English version

Road marking materials – Retroreflecting road studs – Part 2: Road test performance specifications

Produits de marquage routier – Plots rétroféchissants – Partie 2: Essai routier

Straßenmarkierungsmaterialien – Retroreflektierende Markierungsknöpfe – Teil 2: Feldprüfungen

This European Standard was approved by CEN on 12 November 1999.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 1463-2:2000 E

Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 226, Road equipment, the Secretariat of which is held by AFNOR.

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 July 2000, and conflicting national standards shall be withdrawn at the latest by July 2000.

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.

The annexes A and B of this European Standard are informative.

Introduction

Retroreflecting road studs are horizontal guiding devices that reflect incident light by means of retroreflectors in order to warn, guide or inform road users. They may be constructed in one or more integral parts and may be bonded to, anchored within or embedded within the road surface. Retroreflecting road studs are provided either as permanent or temporary devices for road users.

The initial performance requirements such as dimensions, night-time visibility, night-time colour, daytime visibility etc. are specified in EN 1463-1.

In this part of this standard, suitable methods are given for conducting road trials with the aim of achieving comparability and reproducibility of test results.

1 Scope

This European Standard describes a test method for carrying out road trials on retroreflecting road studs for use in both permanent and temporary applications. Specifications are given for test sites and for application patterns, and a recommendation is given for the presentation of the results in the form of a test report.

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 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 1463-1:1997 Road marking materials – Retroreflecting road studs – Part 1 : Initial performance requirements

3 Definitions

For the purposes of this standard the definitions of EN 1463-1:1997 and the following apply:

3.1 test stud: a retroreflecting road stud submitted for conformity testing in accordance with this standard

3.2 permanent stud: a retroreflecting road stud providing night-time warning guidance and information to road users in permanent applications

3.3 temporary stud: a retroreflecting road stud providing daytime and night-time warning guidance and information to the road user at road construction or maintenance sites

4 Requirements

4.1 Test sites and their testing conditions

4.1.1 General

Test sites shall be arranged at suitable locations which meet at least the requirements of 4.1.2 to 4.1.5. The test results will depend on the weather, traffic and road surface conditions. These shall all be described in a general report for the test site.

4.1.2 General specifications for test sites

Roads used for test sites shall be straight, with the lowest longitudinal and transverse gradient possible and without singular points (such as traffic lights and intersections), substantial obstacles to daylight, sources of frequent dirt (such as quarries and field exits) and tracked vehicles.

Any change of site conditions during the test period shall be avoided.

The lengthwise slope and any special circumstances shall be stated in the general report for the test site.

4.1.3 Weather conditions

At the termination of a road trial, it is recommended to produce a weather report for the duration of the road trial. The weather report can be based on data from the nearest meteorological station and it can include data obtained on the test site itself; it should include aspects of the weather of influence to the results of the road trial.

If it is agreed between the participating parties that weather information is to be collected, the weather report shall include as a minimum an account of temperature conditions during the testing period.

> NOTE: The weather report can include a monthly account of mean minimum and maximum day temperatures, the cumulated precipitations in millimetres of water and the number of sand/grit scattering actions, snow ploughing actions etc.

4.1.4 Traffic conditions

Studs shall be tested on a dual carriageway road of two lanes in each direction so that traffic can be re-directed for safe installation and subsequent assessments. On this test site there shall be no other than the national maximum speed limit.

The annual average daily traffic (AADT) of test sites shall be at least 5 000 for the total carriageway in the test direction and shall contain 10 % to 25 % heavy vehicles. A vehicle is considered a heavy vehicle if its maximum gross mass is greater than 7 500 kg.

> NOTE: Other special requirements (e.g. snow clearance, studded tyres) not included in the general minimum requirements as specified in this clause, but considered indispensable for some countries or special applications, may be taken into account by the participating parties for the selection of the test site and recorded in the general report for the test site.

4.1.5 Road surface conditions

Road trials shall be carried out on asphaltic road surfaces of an age of one year or more, in good condition and without damage in the form of wheel tracks, fissures, cracks or similar.

4.2 Organization of road trials

4.2.1 Duration

The duration of road trials shall be:

- one year for permanent studs;
- four months for temporary studs.

4.2.2 Longitudinal application patterns

Test studs shall be applied as:

- lane separation lines instead of road marking, or
- in the gaps between existing lane separation lines, or
- alongside and immediately adjacent to existing lane separation lines (to the right of the line for traffic driving on the right and to the left of the line for traffic driving on the left).

The longitudinal spacing of the test studs shall be as follows:

- permanent studs: 2,5 m to 18 m;
- temporary studs: 1 m to 5 m.

4.3 Application

4.3.1 Technical specifications

The test results depend on the quality of application, the method of application and weather conditions. Reference shall be made to the technical specifications for the stud product and the fixing system which shall be submitted by the supplier. These technical specifications shall be accompanied by a dimensioned drawing and description of the material(s) and fixing methods appropriate to the stud.

4.3.2 Number of studs

Fifty test studs shall be applied.

Test studs of one product shall not be interspaced or mixed with test studs of another product.

4.3.3 Retroreflecting lens colour

For the road trial white, yellow or amber retroreflecting road studs shall be used.

4.3.4 Periods of application

The periods of application of test studs shall be at a time of the year when weather conditions are suitable.

NOTE 1: The participating parties may agree to include one or more periods for application. One period can for instance be for temporary studs and another for permanent studs. It is of practical advantage to keep the periods as short as possible.

NOTE 2: For temporary studs the period of application is recommended to start between April and June.

4.3.5 Conditions allowing application

Application of test studs shall be in accordance with the instructions of the manufacturer.

NOTE 1: The participating parties may agree to include a specification for suitable weather conditions, for example, the road surface temperature to be at least 3 °C above the dew point of the air and the road surface temperature to be between 10 °C and 50 °C. The participating parties may agree that the application of test studs with a slow drying adhesive may be delayed if the road is to be opened to traffic within at most 2 h.

NOTE 2: Studs may be applied when the road surface is wet if water tolerant adhesives are specified by the test stud manufacturer.

5 Road trial procedure

5.1 General

At the end of the field trial testing period, the procedures described in 5.2 to 5.7 shall be followed.

5.2 Stage 1: daylight examination

a) Examine whether the enveloping profiles of all test studs present sharp edges to traffic as a result of damage, wear or separation of parts of the stud;

b) any missing test stud shall be considered as non-conforming;

c) record conforming and non-conforming studs on the Road Trial Assessment Form (RTAF);

d) if the total number of test studs remaining is less than 45, the assessment shall be considered void;

e) all non-conforming studs according to 5.2a) should for safety reasons be removed from the road as quickly as possible before proceeding to 5.3.

NOTE: An example of a RTAF is given in annex A.

5.3 Stage 2: night-time examination

After sunset position a car on the road so that its driver is aligned with the line of studs to be tested. The headlights shall be on dipped beam.

a) For test studs still conforming after stage 1 determine at a distance of 50 m ± 3 m for permanent studs, or 20 m ± 2 m for temporary studs, whether the stud has any retroreflection If a test stud has no retroreflection at all it is non-conforming;

b) record conforming and non-conforming test studs on the RTAF.

5.4 Stage 3: primary assessment

After stages 1 and 2 count the remaining conforming test studs.

5.5 Stage 4: selection of test studs for photometric testing

a) Select from the conforming test studs identified after stage 3;

b) select using a numerical sequence until 10 test studs have been selected using the position number of the test studs as recorded on the RTAF;

c) starting at the lowest numbered conforming test stud, select every 5th conforming test stud. Keep the sequence continuous by returning to the lowest numbered conforming test stud not already selected until 10 test studs have been selected.

5.6 Stage 5: removal of selected test studs

When photometric testing is to be carried out in the laboratory, the selected test studs shall be removed according to the following procedure:

a) before removing the selected studs mark and identify the test stud body with its position number and the face which is opposite to the direction of traffic, which will not be tested;

b) remove all selected test studs;

c) it is essential that during the removal, packaging and transportation procedure, there is no damage to the reflective lens face to be tested. Any damage caused during or after removal will negate the selected test stud. Another test stud shall be selected by continuing the procedure described in stage 4.

5.7 Photometric test

5.7.1 Procedure

To assess photometric degradation the following procedure shall be applied:

a) clean the retroreflectors;

NOTE: Care should be taken during the cleaning process to ensure that the performance of the retroreflectors is not influenced. The use of abrasives, abrasive tools, chemical solvents, high pressure jets and any other surface influencing methods should be avoided. A recommended method of cleaning is: store the studs in a water bath with a detergent at room temperature for 12 h. Try to remove the residual dirt with a soft paint brush under running water. Let the studs dry in air. Before measurement, carefully clean them once more with a soft cotton cloth;

b) measure the night-time visibility of the cleaned retroreflectors in accordance with 5.7.2;

c) measure the daytime visibility (temporary studs only) in accordance with 5.7.3.

5.7.2 Night-time visibility measurement

Measure the coefficient of luminous intensity *R* of the retroreflective face of each of the 10 test studs in accordance with EN 1463-1:1997 at an observation angle of 0,3° and an entrance angle of ± 5° and calculate the arithmetic mean for the 10 test studs.

Retroreflecting road studs that are identical in every aspect except for lens colour and conform to EN 1463-1:1997, 5.3.1, will automatically conform if the test studs conform.

5.7.3 Daytime visibility measurement (temporary studs only)

Measure the luminance factor of the top of each of the 10 test studs in accordance with EN 1463-1:1997. Exclude the two highest and the two lowest values and calculate the arithmetic mean for the remaining six test studs.

6 Performance for road users

The results obtained after clause 5 shall be classified as follows.

a) Primary assessment (see 5.4):

- class S0: no performance determined;
- class S1: 42 and above studs remaining;
- class S2: 35 to 41 studs remaining;
- class S3: 1 to 34 studs remaining.

b) Night-time visibility (see 5.7.2):

- class R0: no performance determined;
- class R1: mean *R* 100 % or more of EN 1463-1:1997, 5.3.1;
- class R2: mean *R* from 50 % to 99 % of EN 1463-1:1997, 5.3.1;
- class R3: mean *R* from 20 % to 49 % of EN 1463-1:1997, 5.3.1;
- class R4: mean *R* from 1 % to 19 % of EN 1463-1:1997, 5.3.1.

c) Daytime visibility (see 5.7.3):

- class DV0: no performance determined;
- class DV1: 80 % or more of the luminance factor of EN 1463-1:1997, table 10;
- class DV2: 1% to 79% of the luminance factor of EN 1463-1:1997, table 10.

Annex A (informative)
Example of road trial assessment form (RTAF)

Stage 1 and 2:

Applicant Position number	Stage 1	Stage 2
1	P	P
2	P	P
3	P	F
4	P	F
5	P	F
6	P	P
7	P	P
8	P	P
9	P	P
10	P	P
11	P	P
12	P	P
13	P	P
14	P	P
15	P	P
16	P	P
17	P	P
18	P	P
19	P	P
20	P	P
21	F	F
22	P	P
23	P	P
24	P	P
25	P	P
26	P	P
27	P	P
28	P	P
29	P	P
30	P	P
31	P	P
32	P	P
33	P	P
34	P	P
35	P	P
36	P	P
37	P	P
38	P	P
39	P	P
40	F	F
41	F	F
42	P	P
43	P	P
44	P	P
45	P	P
46	P	F
47	P	P
48	P	P
49	P	P
50	P	P
Σ P	47	43
Σ F	3	7
Σ All	50	50

Stages 1 to 5

NOTE: P = Pass (conforming)
F = Fail (non-conforming)

Stage 3: Primary assessment:

Stage 1: Number of passed test studs: 47

If number of passed studs is less than 45 assessment shall be considered void.

Stage 2: Number of remaining test studs: 43

Stage 4: Selection of test studs (10) for photometric testing procedure:

a) use the stage 2 column;

b) count or circle only test studs marked P;

c) starting at the lowest numbered test stud, circle every fifth test stud keeping the consecutive count, returning to the top of the column and continuing until 10 test studs have been selected.

Position number of selected test stud:

1	8
2	13
3	18
4	24
5	29
6	34
7	39
8	47
9	2
10	11

Stage 5: Removal of selected test studs:

a) mark the test stud body with its position number on opposite traffic lens which will not be tested;

b) remove the test studs carefully for laboratory testing.

Annex B (informative)

Example of test report

Name and reference:
Manufacturers, name and address:
Applicant company with address:
Laboratory in charge of the road test:

Type of test studs : (EN 1463-1: 1997, clause 4)	
Marking of test studs: (EN 1463-1: 1997, clause 7)	
Dimensions of test studs: (EN 1463-1: 1997, 5.2) Height class	
Maximum horizontal dimension class	
Minimum horizontal dimension class (temporary studs)	

Duration of road test:	
Start date:	
End date:	

Weather conditions: (EN 1463-2: 1999, 4.1.3)	
Number of snow ploughing actions:	
Number of salt scattering actions:	
Number of sand scattering actions:	
Other remarks:	

Traffic conditions: (EN 1463-2: 1999, 4.1.4)	
Annual average daily traffic (AADT):	
Percentage of heavy vehicles:	
Approximate percentage of wheel passages with studded tyres:	

Road test results	result according to EN 1463-2	class according to EN 1463-2
Primary assessment (according to EN 1463-2:1999, 5.4)		
Night-time visibility measurement (according to EN 1463-2:1999, 5.7.2)		
Daytime visibility assessment (according to EN 1463-2:1999, 5.7.3, only for temporary studs)		

blank

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001. Email: orders@bsi-global.com. Standards are also available from the BSI website at http://www.bsi-global.com.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: +44 (0)20 8996 7111. Fax: +44 (0)20 8996 7048. Email: info@bsi-global.com.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: +44 (0)20 8996 7002. Fax: +44 (0)20 8996 7001. Email: membership@bsi-global.com.

Information regarding online access to British Standards via British Standards Online can be found at http://www.bsi-global.com/bsonline.

Further information about BSI is available on the BSI website at http://www.bsi-global.com.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL