BRITISH STANDARD

BS EN 12899-1:2001

Including Corrigenda Nos. 1 and 2

Fixed, vertical road traffic signs —

Part 1: Fixed signs

The European Standard EN 12899-1:2001 has the status of a British Standard

ICS 93.080.30

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

BSI Documents
Document Sharing Hub
British Standards

Full document details: BS EN 12899-1:2001

National foreword

This British Standard is the official English language version of BS EN 12899-1:2001. Together with BS 8442:2006, BS EN 1463-1:1998 and BS EN 1463-2:2000, 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supersedes BS 873-1:1983, BS 873-2:1984, BS 873-4:1987, BS 873-5:1983, BS 873-6:1983 and BS 873-7:1984, which are withdrawn.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/509/3, Traffic signs.

A list of organizations represented on B/509/3 can be obtained on request to its secretary.

Additional information

BS EN 12899-1:2001 fully takes into account the requirements of the European Commission Mandate M/111, Circulation fixtures, given under the EU Construction Products Directive (89/106/EEC), but is not intended to lead to CE marking.

BS EN 12899-1:2001 is a standard which sets down performance values rather than a method of manufacture. It has, in most cases, several performance classes for each property such as coefficient of retroreflection (R').

It replaces those parts of BS 873 that apply to fixed vertical traffic signs, parts 1 and 7 (clauses dealing with non-illuminated posts).

BS EN 12899-1:2001 gives guidance and background information to manufacturers of fixed vertical road traffic signs on the use of BS EN 12899-1:2001. In particular it provides guidance in relation to the information that a manufacturer receives from purchasers. This would enable road traffic signs to be designed and manufactured on the basis of that information whilst conforming to BS EN 12899-1:2001. Information on visual and physical performance classes is also included.

This British Standard, having been prepared under the direction of the Building and Civil Engineering Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 16 May 2002

© BSI 2006

ISBN 0 580 37515 3

Amendments issued since publication

Amd. No.	Date	Comments
14000 Corrigendum No. 1	5 August 2002	Correction to date of withdrawal
16697 Corrigendum No. 2	31 October 2006	Addition of National Annex NA

Documents
Document Sharing Hub

Full document details: BS EN 12899-1:2001

BS EN 12899-1:2001 has different performance classes and some classes comprise a range of values. Recommended classes for visual and physical performance properties considered most suitable for UK practice is given in National Annex NA.

In the opinion of BSI Technical Committee, areas not covered by BS EN 12899-1:2001 that affect its use in practice are summarized below. Guidance is given on some of these matters in the National Annex NA:

— microprismatic material;

— external illumination of signs;

— defined safety factors for use when calculating or testing physical performance;

— methods that state the physical characteristics of sign supports separately from the complete sign assembly;

— the specification of posts as separate products.

NOTE 1 Example values are given in the example calculation in informative Annex B, these values are neither normative nor comprehensive. This annex will be omitted in a future revision of BS EN 12899-1:2001.

NOTE 2 A revision of BS EN 12899-1:2001 is in progress and a national annex will be included to give additional advice on application. It is likely to be late in 2007 before this revision is issued.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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

Documents
Document Sharing Hub
Full document details: BS EN 12899-1:2001

blank

Documents
Document Sharing Hub

Full document details: BS EN 12899-1:2001

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12899-1

December 2001

ICS 93.080.30

English version

Fixed, vertical road traffic signs - Part 1: Fixed signs

Signaux fixes de signalisation routière verticale - Partie 1: Panneaux fixes

Ortsfeste, vertikale Straßenverkehrszeichen - Teil 1: Ortsfeste Verkehrszeichen

This European Standard was approved by CEN on 20 January 2001.

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 Management Centre 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 Management Centre 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

Management Centre: rue de Stassart, 36 B-1050 Brussels

© 2001 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.

Ref. No. EN 12899-1:2001 E

Documents
Document Sharing Hub

Full document details: BS EN 12899-1:2001

Contents

Foreword 3
Introduction 4
1 Scope 5
2 Normative references 5
3 Terms and definitions, symbols and abbreviations 6
4 Dimensions and tolerances 7
5 Performance requirements 7
6 Methods of test 18
7 Marking, labelling and product information 20
Annex A (informative) **Tests for structural properties** 22
Annex B (informative) **Example of structural calculation based on allowable deflections** 24
Annex C (normative) **Test points for horizontal and vertical loads** 34
National Annex NA (informative) **Recommendations for fixed traffic signs** 45

Documents
Document Sharing Hub
Full document details: BS EN 12899-1:2001

Foreword

This European Standard has been prepared by the 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 June 2002, and conflicting national standards shall be withdrawn at the latest by December 2005.

EN 12699 consists of the following parts, under the general title *Fixed, vertical road traffic signs*

— *Part 1 : Fixed signs*

— *Part 2 : Transilluminated traffic bollards*

— *Part 3 : Road delineators and road reflective devices (delineation posts)*

— *Part 4 : Evaluation of conformity, factory production control*

— *Part 5 : Evaluation of conformity, initial type testing*

It derives from performance requirements and test methods published in CEN, CENELEC, CIE and ISO documents together with standards of the CEN member organisations.

The annexes A and B are informative. Annex C is normative.

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.

Documents
Document Sharing Hub

Full document details: BS EN 12899-1:2001

Introduction

This standard is for use by Road Authorities and private developers who wish to use signs similar to those used on public highways on their own land.

The standard may be used to implement type approval and certification testing.

Documents
Document Sharing Hub
Full document details: BS EN 12899-1:2001

1 Scope

This part of EN 12899:2001 specifies requirements for new fixed signs :

— non-retroreflective and retroreflective fixed signs ;

— non-retroreflective and retroreflective fixed signs when they are illuminated at night by external lighting luminaires ; and

— transilluminated signs.

The main intended use of fixed signs is for the instruction and guidance of road users on public and private land.

It defines performance limits and a range of performance classes for both sign assemblies without vertical supports and assemblies complete with vertical supports, as well as sign faces and supporting substrates, sign fixings and supports and external lighting luminaires.

Colorimetric and retroreflective properties as well as the luminance are specified. The retroreflective properties are in respect of materials based on the use of glass bead technology only. Structural requirements for signs and sign supports include performance under static and dynamic loading.

It also defines performance levels to be maintained after natural weathering exposure.

NOTE Where tests for extremely low temperatures are required they should be in accordance with the customer's requirements.

This standard does not require the replacement of existing signs.

Products and requirements not covered by this standard :

a) sign gantries, cantilevers and sign foundations ;

b) signs constructed from light emitting diodes (LED) or fibre optics ;

c) variable message signs ;

d) transilluminated retroreflective signs ;

e) passive safety performance requirements of sign support structures against vehicle impact ;

f) signs used for temporary purposes.

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 any 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 (including amendments).

EN 40-5, *Lighting columns – Part 5 : Specification for steel lighting columns.*

EN 60529:1991, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989).*

EN 12767, *Passive safety of support structures for road equipment – Requirements and test methods.*

EN 60598-1:1990, *Luminaires – Part 1 : Specification for general requirements and tests (IEC 60598-1:1996, modified).*

AVA Documents
Document Sharing Hub

Full document details: BS EN 12899-1:2001

ENV 1995-1-1, *Eurocode 5 - Design of timber structures – Part 1-1 : General rules and rules for buildings.*

ENV 1999-1-1, *Eurocode 9 : Design of aluminium structures - Part 1-1 : General rules and rules for buildings.*

ENV 1991-2-4:1995, *Eurocode 1 : Basis of design and actions on structures – Part 2-4 : Actions on structures – Wind actions.*

ENV 1993-1-1:1992, *Eurocode 3 : Design of steel structures - Part 1-1 : General rules and rules for buildings.*

ISO 4, *Information and documentation – Rules for the abbreviation of title words and titles of publications.*

ISO 139, *Textiles - Standard atmospheres for conditioning and testing.*

ISO 877, *Plastics - Methods of exposure to direct weathering, to weathering using glass - Filtered daylight, and to intensified weathering by daylight using Fresnel mirrors*.

ISO 1459, *Metallic coatings – Protection against corrosion by hot dip galvanised – Guiding principles.*

ISO 1461, *Hot dip galvanised coatings on fabricated iron and steel articles - Specifications and test methods.*

ISO 6272, *Paints and varnishes - Falling-weight test.*

ISO 9227, *Corrosion tests in artificial atmospheres - Salt spray tests.*

CIE 15.2, *Colorimetry.*

CIE 17.4, *International lighting vocabulary.*

CIE 39.2, *Recommendations for surface colours for visual signalling*.

CIE 54, *Retroreflection definition and measurement*.

CIE 74, *Roadsigns*.

3 Terms and definitions, symbols and abbreviations

For the purposes of this European Standard, the symbols and abbreviations given in ISO 4 apply. The photometric terms and definitions given in CIE 17.4 and the sign descriptions given in CIE 74 also apply, together with the following :

3.1
fixed sign
sign which is intended to remain fixed in position and whose supports are usually set into the ground

3.2
protective edge
fabrication intended to reinforce the edge of the sign and to reduce the severity of personal injury in the event of bodily impact with the sign edge

3.3
substrate
material used to support the non-retroreflective and retroreflective sign face materials

3.4
standard shape sign faces
circles, triangles, squares, diamonds and octagons containing legends in accordance with the provisions of the Vienna Convention

Documents
Document Sharing Hub
Full document details: BS EN 12899-1:2001

3.5
sign face
material or materials applied to the substrate to produce the finished surface of the fixed sign

4 Dimensions and tolerances

4.1 Dimensions and tolerances of standard shape sign faces

The dimensions and tolerances of standard shape sign faces shall conform to the customer's requirements.

4.2 Corner radii

Unless otherwise specified in the customer's requirements the corner radii shall be not less than 10 mm.

5 Performance requirements

5.1 Design

5.1.1 General

Steel constructions and steel mounting elements shall conform to ENV 1993-1-1:1992.

Aluminium constructions shall conform to ENV 1999-1-1.

Timber constructions shall conform to ENV 1995-1-1.

Other materials are acceptable but if they are used the fixed signs shall conform to this standard.

The colour of the back of the substrate shall be in accordance with the customer's requirements.

Welded fabrications shall comply with the appropriate codes and standards.

5.1.2 Piercing

When sign substrates are stiffened with additional reinforcing members, these shall be fixed to the sign substrate to conform with Table 1.

Table 1 — Piercing of sign face

Class	Requirements
P1	The sign face shall be pierced only at intervals of not less than 150 mm in any direction, except when required for the purpose of securing the sign substrate to the supporting structure
P2	The sign face shall be not pierced, except when required for the purpose of securing the sign substrate to the supporting structure
P3	The sign face shall not be pierced for any reason

5.1.3 Sign edges

Sign edges shall conform to Table 2.

AVA Documents
Document Sharing Hub

Full document details: BS EN 12899-1:2001

Table 2 — Edges of sign plates

Class	Requirements
E1	Non-protective, the substrate being a flat sheet of material
E2	Protective, with the edge stamped, formed, pressed, or covered by an edging profile
E3	Protective, protection being provided by the mounting structure

5.1.4 Fixings

Sign fixings shall fit sign supports such that they prevent rotation around the support and enable conformance to 5.3.1 to 5.3.3. Sign fixings shall also conform to 5.3.5.

5.1.5 Supports

Supports shall conform to 5.3.1 to 5.3.5 and 5.3.8. Hollow supports shall be enclosed at the top to prevent moisture ingress.

5.1.6 External lighting luminaires

External lighting luminaires shall conform to EN 60598-1 and to 5.3.8.

The structural design shall include the whole structure consisting of housing, support and fixings. Lamps shall be protected by a housing against rain, wind load and other adverse outdoor conditions. Luminaire housings and luminaire panels shall conform to 5.3.8.

NOTE Luminaires should be mounted so as not to obscure the driver's view of the sign face.

5.1.7 Sign housings for transilluminated signs

Sign housings for transilluminated signs shall conform to 5.3.8 and shall be designed to ensure reliable transfer of all static and dynamic forces to the fixing and mounting structures. The walls of the housing shall be designed to satisfy the static requirements. Corners shall be rounded. The design shall ensure that rainwater does not run off the housing and down the sign face.

5.1.8 Base compartments

Where electrical apparatus is to be housed in a sign post, the post shall be fitted with a base compartment conforming to EN 40-5. Each base compartment shall be fitted with a secure lock and shall conform to 5.3.8.

5.2 Visual performance

5.2.1 Colour and luminance factor

5.2.1.1 Daylight appearance of non-retroreflective signs

When tested in accordance with the procedure specified in 6.4, the chromaticity and the luminance factor β shall conform to Table 3 or Table 4.

Documents
Document Sharing Hub
Full document details: BS EN 12899-1:2001

Table 3 — Chromaticity and luminance factors Class NR 1 : Non-retroreflective signs

Colour	1		2		3		4		Luminance factor
	x	y	x	y	x	y	x	y	β
White	0,350	0,360	0,300	0,310	0,290	0,320	0,340	0,370	≥ 0,75
Yellow	0,522	0,477	0,470	0,440	0,427	0,483	0,465	0,534	≥ 0,45
Orange	0,610	0,390	0,535	0,375	0,506	0,404	0,570	0,429	≥ 0,20
Red	0,735	0,265	0,674	0,236	0,569	0,341	0,655	0,345	≥ 0,07
Blue	0,078	0,171	0,196	0,250	0,225	0,184	0,137	0,038	≥ 0,05
Green	0,313	0,682	0,313	0,453	0,177	0,362	0,026	0,399	≥ 0,10
Brown	0,510	0,370	0,427	0,353	0,407	0,373	0,475	0,405	0,04 ≤β ≤ 0,15
Grey	0,350	0,360	0,300	0,310	0,290	0,320	0,340	0,370	0,16 ≤β ≤ 0,24
Black	0,385	0,355	0,300	0,270	0,260	0,310	0,345	0,395	≤ 0,03

Table 4 — Chromaticity and luminance factors Class NR2 : Non-retroreflective signs

Colour	1		2		3		4		Luminance factor
	x	y	x	y	x	y	x	y	β
White	0,305	0,315	0,335	0,345	0,325	0,355	0,295	0,325	≥ 0,75
Yellow	0,494	0,505	0,470	0,480	0,493	0,457	0,522	0,477	≥ 0,45
Red	0,735	0,265	0,700	0,250	0,610	0,340	0,660	0,340	≥ 0,07
Green	0,230	0,440	0,260	0,440	0,260	0,470	0,230	0,470	≥ 0,10
Blue	0,140	0,140	0,160	0,140	0,160	0,160	0,140	0,160	≥ 0,05
Brown	0,467	0,386	0,447	0,386	0,447	0,366	0,467	0,366	0,04 ≤β ≤ 0,15
Grey	0,305	0,315	0,335	0,345	0,325	0,355	0,295	0,325	0,16 ≤β ≤ 0,24

NOTE The limits specified in Table 3, with the exception of brown and grey, are recommended in CIE 39.2 as surface colours for visual signalling and; when colours deteriorate beyond these chromaticity limits the signs may not be suitable for the intended purpose. The chromaticity limits specified in table 4 ensure a more uniform appearance and consistency in the colour of new signs which are installed at different times than the limits specified in Table 3. Colours conforming to the limits of Table 4 may also be expected to take longer to deteriorate beyond the limits of Table 3.

5.2.1.2 Daylight appearance of retroreflective signs

When illuminated with CIE standard illuminant D 65 and measured with 45/0 geometry, the chromaticity and the luminance factor β shall conform to Table 5 or Table 6.

Documents
Document Sharing Hub
Full document details: BS EN 12899-1:2001

Table 5 — Chromaticity and luminance factors Class R1 : Retroreflective signs

Colour	1		2		3		4		Luminance factor β	
	x	y	x	y	x	y	x	y	Table 8	Table 9
White	0,355	0,355	0,305	0,305	0,285	0,325	0,335	0,375	≥ 0,35	≥ 0,27
Yellow see Table 8	0,522	0,477	0,470	0,440	0,427	0,483	0,465	0,534	≥ 0,27	
Yellow see Table 9	0,545	0,454	0,487	0,423	0,427	0,483	0,465	0,534		≥ 0,16
Orange	0,610	0,390	0,535	0,375	0,506	0,404	0,570	0,429	≥ 0,17	≥ 0,14
Red	0,735	0,265	0,674	0,236	0,569	0,341	0,655	0,345	≥ 0,05	≥ 0,03
Blue	0,078	0,171	0,150	0,220	0,210	0,160	0,137	0,038	≥ 0,01	≥ 0,01
Green	0,007	0,703	0,248	0,409	0,177	0,362	0,026	0,399	≥ 0,04	≥ 0,03
Dark Green	0,313	0,682	0,313	0,453	0,248	0,409	0,127	0,557	0,01 ≤ ß ≤ 0,07	
Brown	0,455	0,397	0,523	0,429	0,479	0,373	0,558	0,394	0,03 ≤ ß ≤ 0,09	
Grey	0,350	0,360	0,300	0,310	0,285	0,325	0,335	0,375	0,12 ≤ ß ≤ 0,18	

Table 6 — Chromaticity and luminance factors Class R2 : Retroreflective signs

Colour	1		2		3		4		Luminance factor β	
	x	y	x	y	x	y	x	y	Table 8	Table 9
White	0,305	0,315	0,335	0,345	0,325	0,355	0,295	0,325	≥ 0,35	≥ 0,27
Yellow see Table 8	0,494	0,505	0,470	0,480	0,493	0,457	0,522	0,477	≥ 0,27	
Yellow see Table 9	0,494	0,505	0,470	0,480	0,513	0,437	0,545	0,454		≥ 0,16
Red	0,735	0,265	0,700	0,250	0,610	0,340	0,660	0,340	≥ 0,05	≥ 0,03
Blue see Table 8	0,130	0,086	0,160	0,086	0,160	0,120	0,130	0,120	≥ 0,01	
Blue see Table 9	0,130	0,090	0,160	0,090	0,160	0,140	0,130	0,140		≥ 0,01
Green see Table 8	0,110	0,415	0,150	0,415	0,150	0,455	0,110	0,455	≥ 0,04	
Green see Table 9	0,110	0,415	0,170	0,415	0,170	0,500	0,110	0,500		≥ 0,03
Dark Green	0,190	0,580	0,190	0,520	0,230	0,580	0,230	0,520	0,01≤ β ≤ 0,07	
Brown	0,455	0,397	0,523	0,429	0,479	0,373	0,558	0,394	0,03 ≤ β ≤ 0,09	
Grey	0,305	0,315	0,335	0,345	0,325	0,355	0,295	0,325	0,12 ≤ β ≤ 0,18	

NOTE The limits specified in Table 5, with the exception of dark green, brown and grey, are recommended in CIE 39.2 as surface colours for visual signalling. When colours deteriorate beyond these chromaticity limits the signs may not be suitable for the intended purpose. The chromaticity limits specified in Table 6 ensure a more uniform appearance and consistency in the colour of new signs which are installed at different times than the limits specified in Table 5. Colours conforming to the limits of table 6 may also be expected to take longer to deteriorate beyond the limits of table 5.

Documents
Document Sharing Hub
Full document details: BS EN 12899-1:2001

5.2.1.3 Colour of transilluminated signs

Transilluminated sign colours in daytime and night-time conditions shall conform to the requirements of Table 7.

Table 7 — Chromaticity and luminance factors : Transilluminated signs

Colour	Day/ Night	1		2		3		4		Luminance factor ß	
		x	y	x	y	x	y	x	y	Min.	Max.
Red	D/N	0,690	0,310	0,595	0,315	0,569	0,341	0,655	0,345	0,07	--
Orange	D/N	0,610	0,390	0,535	0,375	0,506	0,404	0,570	0,429	0,20	--
Yellow	D/N	0,522	0,477	0,470	0,440	0,427	0,483	0,465	0,534	0,45	--
Green*	D/N	0,313	0,682	0,313	0,453	0,209	0,383	0,013	0,486	0,10	--
Blue	D/N	0,078	0,171	0,196	0,250	0,225	0,184	0,137	0,038	0,05	--
Purple	D/N	0,302	0,064	0,307	0,203	0,374	0,247	0,457	0,136	0,05	--
White	D	0,350	0,360	0,300	0,310	0,290	0,320	0,340	0,370	0,75	--
White	N	0,440	0,382	0,285	0,264	0,285	0,332	0,440	0,432	--	--
Grey	D	0,350	0,360	0,300	0,310	0,290	0,320	0,340	0,370	0,16	0,24
Grey	N	0,440	0,382	0,285	0,264	0,285	0,332	0,440	0,432	--	--
Black	D/N	0,385	0,355	0,300	0,270	0,260	0,310	0,345	0,395	--	0,03
Green[a]	D/N	0,313	0,682	0,313	0,453	0,177	0,362	0,026	0,399	0,10	--

[a] For the use of green see the recommendations of CIE 39.2.

5.2.2 Coefficient of retroreflection R'

The minimum initial coefficient of retroreflection R' ($cd \cdot lx^{-1} \cdot m^{-2}$) of retroreflective signs when measured in accordance with the procedure specified in CIE 54, using CIE standard illuminant A, shall conform to Tables 8 or 9, as appropriate.

The coefficient of retroreflection (R') of all printed colours, except white, shall be not less than 70 % of the values in Tables 8 or 9 for Class Ref 1 and Class Ref 2 signs respectively.

Documents
Document Sharing Hub
Full document details: BS EN 12899-1:2001

Table 8 — Coefficient of retroreflection R' : Class Ref 1
unit : cd·lx^{-1}·m^{-2}

Geometry of measurements		Colour							
α	β_1 (β_2=0)	White	Yellow	Red	Green	Blue	Brown	Orange	Grey
12'	+5°	70	50	14,5	9	4	1	25	42
	+30°	30	22	6	3,5	1,7	0,3	10	18
	+40°	10	7	2	1,5	0,5	#	2,2	6
20'	+5°	50	35	10	7	2	0,6	20	30
	+30°	24	16	4	3	1	0,2	8	14,4
	+40°	9	6	1,8	1,2	#	#	2,2	5,4
2°	+5°	5	3	1	0,5	#	#	1,2	3
	+30°	2,5	1,5	0,5	0,3	#	#	0,5	1,5
	+40°	1,5	1,0	0,5	0,2	#	#	#	0,9
# indicates "Value greater than zero but not significant or applicable".									

Table 9 — Coefficient of retroreflection R' : Class Ref 2
unit : cd ≅ lx^{-1} ≅ m^{-2}

Geometry of measurements		Colour								
α	β_1 (β_2=0)	White	Yellow	Red	Green	Dark Green	Blue	Brown	Orange	Grey
12'	+5°	250	170	45	45	20	20	12	100	125
	+30°	150	100	25	25	15	11	8,5	60	75
	+40°	110	70	15	12	6	8	5,0	29	55
20'	+5°	180	120	25	21	14	14	8	65	90
	+30°	100	70	14	12	11	8	5	40	50
	+40°	95	60	13	11	5	7	3	20	47
2°	+5°	5	3	1	0,5	0,5	0,2	0,2	1,5	2,5
	+30°	2,5	1,5	0,4	0,3	0,3	#	#	1	1,2
	+40°	1,5	1,0	0,3	0,2	0,2	#	#	#	0,7
# indicates "Value greater than zero but not significant or applicable".										

5.2.3 Mean luminance of transilluminated signs

Transilluminated signs shall conform to the requirements of Table 10 when measured in accordance with 6.5.

Documents
Document Sharing Hub
Full document details: BS EN 12899-1:2001

Table 10 — Mean luminance L of transilluminated signs
unit : cd·m^{-2}

Colour	Class L1	Class L2	Class L3
White	$40 \leq L \leq 150$	$150 \leq L \leq 300$	$300 \leq L \leq 900$
Yellow	$30 \leq L \leq 100$	$100 \leq L \leq 300$	$300 \leq L \leq 900$
Red	$6 \leq L \leq 20$	$20 \leq L \leq 50$	$50 \leq L \leq 110$
Blue	$4 \leq L \leq 10$	$10 \leq L \leq 40$	$40 \leq L \leq 80$
Green	$8 \leq L \leq 20$	$20 \leq L \leq 70$	$70 \leq L \leq 180$
Dark Green	$4 \leq L \leq 10$	$10 \leq L \leq 40$	$40 \leq L \leq 80$
Brown	$4 \leq L \leq 10$	$10 \leq L \leq 40$	$40 \leq L \leq 80$

5.2.4 Luminance contrast of transilluminated signs K

The luminance contrast of transilluminated signs, as determined by the ratio of the luminance of the contrast colour to the luminance of the colour, shall conform to the requirements of Table 11.

Table 11 — Luminance contrast K of transilluminated signs

Colour	Blue	Red	Green	Dark Green	Brown
Contrast colour	White	White	White	White & Yellow	White
Luminance contrast	$5 \leq K \leq 15$	$5 \leq K \leq 15$	$5 \leq K \leq 15$	$5 \leq K \leq 15$	$5 \leq K \leq 15$

5.2.5 Uniformity of luminance

For each colour of externally illuminated and transilluminated signs, the uniformity of luminance, determined by the ratio of the lowest to the highest level measured at any part of the sign, shall conform to the requirements of Table 12.

Table 12 – Uniformity of luminance

Class	Maximum ratio
U1	1/10
U2	1/6
U3	1/3

5.3 Physical performance

5.3.1 Structural performance - general

The structural performance of signs and luminaires including their supports and fixings shall be calculated in accordance with 6.6 or 6.7 respectively.

The complete sign assembly shall withstand dead and live loading, multiplied by the appropriate safety factor.

NOTE 1 When calculation in accordance with 6.6 is deemed inappropriate, tests may be made in accordance with Annex A. An example of calculation is given in Annex B.

NOTE 2 In the case of signs mounted on large structures, for example sign gantries, the deflections to be calculated are those between the sign or sign supports and the structure, not the deflection of the structure itself.

AVA Documents
Document Sharing Hub

Full document details: BS EN 12899-1:2001