VOLUME 8 **TRAFFIC SIGNS AND LIGHTING**

SECTION 2 **TRAFFIC SIGNS AND ROADMARKINGS**

PART 2

TA 89/04

USE OF PASSIVELY SAFE SIGNPOSTS TO BS EN 12767

SUMMARY

The Advice Note gives guidance on the use of passively safe signposts to reduce risk of personal injury if errant vehicles strike signposts. Safety barriers to signs on larger signposts may not be necessary where passively safe signposts to BS EN 12767 are employed.

It does not cover signs mounted on horizontal cantilevers or signs on portal gantries over the carriageway as detailed in BD 51 "Portal and Cantilever Sign/Signal Gantries" (DMRB 2.2.4).

INSTRUCTIONS FOR USE

This is a new document to be inserted into the Manual.

1. Remove existing Contents page for Volume 8.
2. Insert new Contents page for Volume 8, dated May 2004.
3. Insert TA 89/04 into Volume 8, Section 2, Part 2.
4. Please archive this sheet as appropriate.

Note: A quarterly index with a full set of Volume Contents Pages is available separately from The Stationery Office Ltd.

THE HIGHWAYS AGENCY

SCOTTISH EXECUTIVE

WELSH ASSEMBLY GOVERNMENT
LLYWODRAETH CYNULLIAD CYMRU

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

THE DEPARTMENT FOR REGIONAL DEVELOPMENT
NORTHERN IRELAND

DRD
Department for Regional Development
www.drdni.gov.uk

Use of Passively Safe Signposts to BS EN 12767

Summary: The Advice Note gives guidance on the use of passively safe signposts to reduce risk of personal injury if errant vehicles strike signposts. Safety barriers to signs on larger signposts may not be necessary where passively safe signposts to BS EN 12767 are employed.

It does not cover signs mounted on horizontal cantilevers or signs on portal gantries over the carriageway as detailed in BD 51 “Portal and Cantilever Sign/ Signal Gantries” (DMRB 2.2.4).

Volume 8 home page

REGISTRATION OF AMENDMENTS

Amend No	Page No	Signature & Date of incorporation of amendments	Amend No	Page No	Signature & Date of incorporation of amendments

Volume 8 home page

REGISTRATION OF AMENDMENTS

Amend No	Page No	Signature & Date of incorporation of amendments	Amend No	Page No	Signature & Date of incorporation of amendments

VOLUME 8 TRAFFIC SIGNS AND LIGHTING

SECTION 2 TRAFFIC SIGNS AND ROADMARKINGS

PART 2

TA 89/04

USE OF PASSIVELY SAFE SIGNPOSTS TO BS EN 12767

Contents

Chapter

1. Introduction
2. Use of Passively Safe Signposts
3. Selection of Signpost Type and Design Requirements
4. Design of Foundations
5. Clearance to Adjacent Traffic
6. Specification and Product Approval
7. Accident Reports
8. References
9. Enquiries

Appendix A Background to and Classification of Signposts to BS EN 12767

Appendix B Accident Report Form for Accidents with Passively Safe Signposts

Volume 8 home page

1. INTRODUCTION

1.1 This Advice Note gives guidance on how passively safe signposts are to be specified to BS EN 12767: "Passive safety of support structures for road equipment - Requirements and test methods" and it also provides guidance on the possible omission of safety barrier protection to such signposts. Passively safe signposts are an appropriate solution for roads with speed limits of 50 mph (80 kph) or more and for lower speed limit locations where safety barriers to signs would otherwise be appropriate.

1.2 Passively safe signposts meet the vehicle impact testing requirements of BS EN 12767. These signposts have the potential to either prevent or reduce the severity of personal injury to occupants of any errant vehicle that impacts such a signpost.

1.3 The document provides designers and highway maintenance organisations with advice on:

i. where passively safe signposts may be used;

ii. selection of appropriate post type to BS EN 12767;

iii. size limits for tubular steel posts or aluminium without safety barrier provision;

iv. designing for wind loading;

v. signpost foundation requirements;

vi. specification of signpost to BS EN 12767; and

vii. sign face requirements.

Implementation

1.4 Passively safe signposts may be used forthwith in accordance with this document on all schemes for the construction and improvement of trunk roads including motorways (and roads designated by the Overseeing Organisation in Northern Ireland), provided that, in the opinion of the Overseeing Organisation this would not result in significant additional expense or delay progress. Design Organisations should confirm its application to particular schemes with the Overseeing Organisation.

1.5 Separate guidance is planned which will address safety barrier provision for existing roadside hazards (including existing larger traffic signposts).

2. USE OF PASSIVELY SAFE SIGNPOSTS

2.1 Tubular steel or aluminium posts of equal or less than 89 mm nominal diameter and 3.2 mm nominal wall thickness are deemed to satisfy BS EN 12767. Tubular posts with a larger nominal diameter or a thicker wall thickness are classed as "larger posts". The above size limits were established by crash testing steel circular hollow section posts to BS EN 12767. It is not anticipated that steel rectangular hollow sections, or concrete signposts with a greater moment capacity than a steel post of 89 mm diameter and 3.2 mm wall thickness circular hollow section would meet the testing requirements of BS EN 12767 and such sections should thus also be viewed as "larger" posts and provided with a safety barrier as necessary. This advice is based on crash tests to signposts mounted on or cast into substantial concrete bases and is thus not applicable to some types of temporary traffic signs.

2.2 The Interim Requirement for Road Restraint Systems (IRRRS) gives guidance on protecting of signs with safety barriers with respect to speed limits and clearances for "larger posts".

2.3 Where a sign is mounted on signposts to BS EN 12767, a permanent safety barrier would not normally be required to protect a vehicle from any impact with the sign. An assessment should be made to see if other highway design or risk features make the provision of a safety barrier necessary.

2.4 For technical approval requirements for highway signs see BD 2 "Technical Approval of Highway Structures" (DMRB 1.1.1). Technical approval is required for signs on posts of more than 4 metres height.

2.5 Passively safe signposts to BS EN 12767 can be appropriate at locations where effective use of safety barriers is difficult. Examples include:

i) services in the verge where the safety barrier posts would be located;

ii) roundabouts where there is not enough room for full safety barrier provision or any safety fences would be vulnerable to full frontal impact

iii) locations where safety barriers or signs have been hit in the past. Some types of passively safe posts are much easier to replace than safety barriers or signs with posts cast into the foundation;

iv) nosings and splitter islands where safety barrier end ramps may be a hazard or safety barriers difficult to install. However, dependent on layout, a post may be displaced into the adjacent carriageway by an impact (a formal departure from standard must be submitted before using passively safe posts at such locations to enable the layout and safety case to be reviewed); and

v) where verge width is inadequate for both a sign and a safety barrier.

2.6 Signs protected by a safety barrier with a working width and layout appropriate to the safety barrier should not require mounting on passively safe posts.

2.7 Passively safe signposts should not be used in central reserves and reserves between parallel carriageways as in any accident, a post or sign face may be displaced into the adjacent carriageway and cause a secondary accident.

3. SELECTION OF SIGNPOST TYPE AND DESIGN REQUIREMENTS

3.1 Passively safe signposts should meet the following BS EN 12767 requirements:

i) Posts to be speed class 100 kph as Table 1 of BS EN 12767 (the 100 kph test includes a lower speed 35 kph test).

ii) Signposts should be either non-energy absorbing category NE or low energy absorbing category LE in accordance with the guidance below:

a) In an accident non-energy absorbing category NE signposts are designed to shear or fail at the base and the detached post and associated sign may fall a short distance from the sign foundation making use of such signs inadvisable in areas regularly used by pedestrians or cyclists. Non-energy absorbing category NE signposts (speed class 100 kph) will normally be the most appropriate choice for use in verges on motorways, dual carriageways and rural single carriageway roads. Tubular steel or aluminium posts of less than 89 mm nominal diameter and 3.2 mm nominal wall thickness are deemed to satisfy NE speed class 100 kph (following crash testing at TRL of steel circular hollow section (CHS) posts, see Chapter 8: reference 5b).

b) Category LE signposts are appropriate where the road is in an urban area or at locations frequently used by pedestrians and/or cyclists (they are less likely to break away from their base than Category NE signposts and thus create a secondary hazard).

c) Passively safe signposts meeting any of the four occupant safety levels specified in Table 3 of BS EN 12767 are acceptable.

Sign Post Spacing

3.2 Where more than one support post is required for a particular sign the passively safe signposts should, to reduce the chance of a car hitting two posts simultaneously, be spaced not closer than 1.5 metre centres. Where a sign is supported by three or more smaller steel circular hollow section posts of under 77 mm nominal diameter, the posts' centres may be reduced (but not to less than 750 mm). For signs supported by two steel circular posts under 77 mm diameter posts may be at closer centres. Nominal wall thickness should not exceed 3.2 mm.

Lighting and Cabling to Signs

3.3 Where signs on passively safe posts require power supply cables for lighting units (or cables for any other purpose) the cables must be provided with pull out plugs (or an equivalent arrangement) located near the base of the signpost to ensure that, should the signpost shear on impact, the signpost or sign fascia are not tethered in any way by the supply cable. The detailed arrangements must address vandalism, electrical safety, reliability and weather resistance in service, electrical safety in vehicle accidents, and retention of pullout/separation capability over the life of the sign. The Overseeing Organisation must approve the electrical equipment and its arrangement.

3.4 Depending on the pullout plug or equivalent arrangement the supplier or contractor may need to provide evidence that the post will still comply with BS EN 12767 if tested with the proposed cable arrangement.

Design of Signposts for strength and deflection

3.5 Signposts should be designed to meet the loading, strength and deflection criteria of BS 873 Part 7. BS 873-7 requires strength to be checked for a design loading of 1.5 kPa. Where signs are more than 1.2 metres from the edge of the adjacent paved carriageway it may be possible in sheltered areas to justify lower wind loads for strength calculations by reference to "DD ENV 1991-2-4: 1997 Eurocode 1: Basis of Design and Actions on Structures. Part 2.4 - Actions on structures - Wind actions" with the Overseeing Organisation's agreement. When the sign is checked for deflection with BS 873-7 with a uniform load of 1 kPa a relaxed deflection limit of 1/25 of overall sign height is permissible. Where the strength of signposts is justified by load testing (rather than calculation in accordance with BS 873-7), the post must

have an overall factor of safety of 1.5 on the design wind load of 1.5 kPa. (such load tests are unrelated to the crash testing requirements of BS EN 12767)

3.6 Paragraph 5.2 of this Advice Note should be consulted for increased wind loading requirements for signs whose fascia is closer than 1.2 metres to the edge of the paved carriageway. Advice on clearances is also given in Paragraph 5.1.

4. DESIGN OF FOUNDATIONS

Signpost Foundation Levels

4.1 The top surface/profile of concrete foundations should in general be the same as the adjacent ground level/profile to avoid the concrete foundation being a danger to vehicles or a trip hazard.

4.2 Where founding on a slope or if there is paving around the signposts the top of the concrete foundation may be positioned just below the adjacent ground level/profile, provided that any buried signpost components are not then vulnerable to corrosion. Backfill material and drainage around the signpost base should be arranged to give free drainage and prevent standing water around the base of the signpost and any anchorage bolts.

4.3 Some passively safe signposts with slip bases rely on impact close to the base to release the post on impact. This type of signpost should not be used on embankment slopes where the vehicle may become airborne and impact the post at a higher level.

5. CLEARANCE TO ADJACENT TRAFFIC

5.1 Signs on passively safe signposts with threaded base plate or post anchorage fixings should generally be installed so that no part of the sign facia is closer than 1.2 metres to the edge of the adjacent paved carriageway (Note: The paved carriageway includes any hard strip or hard shoulder). Larger clearances (where space and signing considerations permit) will enhance safety and reduce the risk of sign damage.

5.2 If signs have to be positioned closer than 1.2 metres to the edge of the adjacent carriageway then any signpost with threaded base plate or post anchorage components shall be designed for a higher wind loading of 3.0 kPa to guard against possible fatigue failure of the threaded components from vehicle induced wind buffeting loads. Foundations may still be designed for the lower loading of 1.5 kPa. Signs should never be closer to the edge of carriageway than the limits given in the Traffic Signs Manual Chapter 1, Part 6.

6. SPECIFICATION AND PRODUCT APPROVAL

Passively Safe Signposts

6.1 Signposts and their foundations must in addition to the requirements of BS EN 12767 continue to meet the requirements of the Series 1200 of the Specification for Highway Works, MCHW Volume 1. However Passively Safe Signposts of lattice construction (not a listed approved type in Series 1200) are acceptable provided they comply with the other 1200 series requirements.

6.2 The following criteria are required to specify a passively safe signpost in accordance with BS EN 12767:

i) Speed rating. This is normally 100 kph;

ii) Energy Class. This is normally Category NE; and

iii) Occupant Safety Level. This is normally by stating all "Occupant Safety Levels" are acceptable.

6.3 Passively safe signposts shall be designed and installed in accordance with the manufacturer's instructions and installed by suitably trained staff.

Product Approval for Passively Safe Signposts

6.4 Only signposts that have been independently tested by an appropriate approved testing organisation and certified to comply with the appropriate class in BS EN 12767 shall be permitted. Prospective suppliers should seek approval from the Overseeing Organisation for their products and demonstrate the testing complies with BS EN 12767.

Sign Faces and other Associated Equipment

6.5 Sign faces should meet the requirements of BS 873-6 except cast aluminium or cast aluminium alloy sign plates are not permitted for use with passively safe signposts (cast sign plates may be too substantial or rigid in an accident).

6.6 It is anticipated that some sign installations may be illuminated or have flashing lights or other electronic equipment attached. Any such equipment must be sufficiently light in weight and be deformable or frangible and be securely fixed so as not to increase the chance of personal injury on impact or invalidate the basis of the original testing to BS EN 12767 (also see paragraphs 3.3 and 3.4).

Wind Loads, Strength and Deflection

6.7 Designers should specify loading, strength and deflection requirements in accordance with paragraphs 3.5, 3.6 and 3.7.

7. ACCIDENT REPORTS

7.1 Area Maintenance Contracts or other Term Maintenance arrangements should provide an Accident Report to the Overseeing Organisation for all vehicle impact accidents damaging a passively safe signpost. The Accident Reports are required for assessment of the safety performance of passively safe signposts. The Accident Report should include where reasonably possible:

i) details of any personal injuries (casualties to be classified as fatal, serious, slight);

ii) damage to signposts and sign (including photographs, if possible);

iii) vehicle type and damage details (include photographs, if possible);

iv) time, date, location, and account of events and police accident number, if applicable;

v) layout plan showing road geometry and sign location;

vi) make, type and size of signpost.

A proforma for the report is attached in Appendix B.

8. REFERENCES

1. Design Manual for Roads and Bridges (DMRB)

BD2 Technical Approval of Highway Structures (DMRB 1.1.1)

2. Manual of Contract Documents for Highway Works (MCHW)

Specification for Highway Works (MCHW 1)

Notes for Guidance on the Specification for Highway Works (MCHW 2)

3. Other Design Organisation Documents

IRRRS (Interim Requirement for Road Restraint Systems)
(this document can be obtained from the Highways Agency by E-mailing a request to HA.IRRRS@highways.gsi.gov.uk)

"Traffic Signs Manual: 1982" Chapter 1
(HMSO ISBN 0-11-550559-8)

4. British Standards and BS EN Standards

BS EN 12767:2000. "Passive safety of support structures for road equipment - Requirements and test methods"

BS 873: "Road traffic signs and internally illuminated bollards":

Part 7 - Specification for posts and fittings

DD ENV 1991-2-4: 1997 Eurocode 1: Basis of Design and Actions on Structures. Part 2.4 Actions on structures - Wind actions (together with United Kingdom National Application Document) (AMD 10671)

5. Miscellaneous

TRL Reports (available from TRL):

a) "Implications of using energy absorbing masts to support signs, without protective safety fencing" TRL Project Report PR/SE/VE/637/02 1st August 03

b) "Passive Safety Tests on Steel Circular Hollow Section sign Posts Tests 09 NB, 10 NB & 12 NB" 1st July 03

(these TRL reports provide the research basis for the Advice Note)

9. ENQUIRIES

All technical enquiries or comments on this Advice Note should be sent in writing as appropriate to:

Divisional Director
Research & Development of Standards Division
The Highways Agency
Sunley Towers
Piccadilly Plaza
Manchester M1 4BE

A JONES
Divisional Director

Chief Road Engineer
Scottish Executive
Victoria Quay
Edinburgh
EH6 6QQ

J HOWISON
Chief Road Engineer

Chief Highway Engineer
Transport Directorate
Welsh Assembly Government
Llywodraeth Cynulliad Cymru
Crown Buildings
Cardiff
CF10 3NQ

J R REES
Chief Highway Engineer
Transport Directorate

Director of Engineering
Department for Regional Development
Roads Service
Clarence Court
10-18 Adelaide Street
Belfast BT2 8GB

G W ALLISTER
Director of Engineering

APPENDIX A BACKGROUND TO AND CLASSIFICATION OF SIGNPOSTS TO BS EN 12767

A.1 Background and Discussion of BS EN 12767

Scandinavian countries have developed lighting columns and posts for signs, that are lightweight and deform readily when impacted by a motor vehicle thus reducing the severity of personal injury rates in accidents where errant vehicles strike this type of street furniture.

BS EN 12767:2000 "Passive safety of support structures for road equipment - Requirements and test methods" details the performance requirements for vehicle crash testing such street furniture. Testing is broadly similar to that for other vehicle restraint systems (See BS EN 1317-1 and BS EN 1317-2).

UK policy has been to install safety barriers in front of signs on motorways and trunk roads where the posts were substantial enough to cause significant damage to an errant vehicle and occupants. The use of passively safe signposts is an alternative to safety barriers that may reduce the chance of personal injury to the occupants of an errant car/vehicle impacting the signpost or indeed any crash barrier.

Circular hollow section steel signposts were crash tested to BS EN 12767 to arrive at the size limit in this document. The safe limits in this document proved lower than earlier limits.

Safety barriers in short lengths (often protecting signs) have problems with the leading end terminals ramping vehicles up in an accident. Passively safe signposts to BS EN 12767 may improve safety at such locations. Safety barriers with energy absorbing terminals to DD ENV 1317-4 are an alternative. Development of signposts that are comparatively safe for the occupants of a vehicle when struck offers an opportunity to:

a) adopt a potentially safer solution than safety barriers and especially safety barriers in short lengths without energy absorbing terminals;

b) obtain cost savings;

c) install signs at locations where the provision of safety barriers may be difficult due to road geometry or services (e.g. telecom cables) in the verge;

d) reduce roadside clutter by omitting safety barriers.

A.2 Classification of Signposts to BS EN 12767

This Appendix gives a limited account of the BS EN 12767 requirements relating to passively safe signposts and their specification. BS EN 12767 should be consulted if fuller information is required.

In accordance with BS EN 12767 passive safety support structures (in this case signposts) are tested and classified to the following criteria:

1) **Speed:** Support structures must be crash tested at one of the 3 speeds 50, 70 and 100kph. An associated low speed test at 35 kph, for each Speed Class, is also required. Speed Class 100kph is recommended for use on roads where the imposed speed limit or design speed equals or exceeds 50mph (80 kph).

2) **Energy Absorption:** It is necessary to specify an energy level (related to how much the specified crash vehicle is to be slowed by the impact) from one of the following categories:

(i) **High energy absorbing (HE)**

HE requirements are aimed at lighting columns. They slow down and stop a vehicle with a short yet gradual retardation. It is not currently envisaged that signposts will be of this type.

(ii) **Low energy absorbing (LE)**

LE signposts will have some of the qualities of both HE and NE signposts. The errant vehicle speed will be reduced and damage to the vehicle will be less than if it had hit an HE support structure. The signposts will be less likely to separate from the base and be thrown into the air on impact than NE signposts. LE posts (when developed) are thus likely to be suitable for areas with regular pedestrians and cyclists.

(iii) **Non energy absorbing (NE)**

NE signposts break away and/or deform relatively easily on being hit so that the errant vehicle will continue at roughly the same speed with only relatively light damage to the vehicle. The signpost will typically buckle on impact before shearing at the base with limited structural damage to the vehicle. The sheared signpost and sign facia are typically displaced over the top of the vehicle and fall in the vicinity of the signpost foundation. NE signposts are likely to be the most appropriate product for signposts in areas without regular pedestrians or cyclists.

3) Occupant safety levels

Required occupant safety levels are categorised by the standard from 1 to 4, with increasing levels of safety reflected by higher numbers.

APPENDIX B ACCIDENT REPORT FORM FOR ACCIDENTS WITH PASSIVELY SAFE SIGNPOSTS

Appendix B to TA89

Safe roads, Reliable journeys, Informed travellers

HIGHWAYS AGENCY

ACCIDENT REPORT FORM FOR ACCIDENTS WITH PASSIVELY SAFE POSTS (*all accidents involving passively safe signs should be reported for safety evaluation purposes)*

Forms are be returned to SSR Safety and Information Division (address at end of form,

HA ref	
Agent	

Please use block capitals

Section 1 DETAILS OF INJURIES	**Fatal ***	**Serious**	**Slight**
a) Number of casualties in each category *(zero returns should be entered)*			
b) Nature of injuries *(or direct cause of death for fatalities)*			

** In a fatal accident an additional full account of the accident should be attached*

Section 2 WHERE AND WHEN

Date dd mm yy

Time 24 hr clock

Road *Class and Number e.g. M25 or A1*

Location *(enter exact location, carriageway, chainage and description of sign hit)*

Section 3 VEHICLE DAMAGE *(enter brief description of damage to vehicle and attach a photograph or photographs if possible)*

Section 4 Vehicle Description *(e.g. Ford Mondeo estate or Luton van)*

Section 5 Details of Sign and posts (to include overall sign size, post maker and type and post length

Post type (e.g. Lattix)		Sign plate type *(e.g. aluminium plate)*	
Post Length in metres		Width in metres	
Post Section		Height in metres	

Section 6 Sign and Post Damage **

(e.g. both Lattix posts sheared off at baseplate level and were heavily distorted, sign plate damaged but re-usable)

*** attach a photograph or photographs if possible showing sign, posts and location*

Volume 8 home page

Section 7 Brief Description of Accident *(include details and cause if known and how any injuries were sustained)*

Section 8 Plan *showing sign, carriageway, track of vehicle and other relevant information*

Any additional information, photographs etc should be attached to this sheet

Completed by	Position
Organisation	Telephone Number
Date	

Return completed form to Derek Gray, Highways Agency, Safety Standards and Research Division, TSE Safety Team, 3C Federated House, London Road, Dorking RH4 1SZ, or E-mail to Derek Gray at XTHCODG@highways.gsi.gov.uk