Vehicle restraint systems —

Part 3: Development of vehicle highway barriers in the United Kingdom





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Committees responsible for this Published Document

The preparation of this Published Document was entrusted by Technical Committee B/509, Road equipment, to Subcommittee B/509/1, Road restraint systems, upon which the following bodies were represented:

Aluminium Federation Association of Consulting Engineers Association of County Councils Association of Safety Fencing Contractors British Cement Association British In-situ Concrete Paving Association British Precast Concrete Federation Ltd. County Surveyors' Society Department of the Environment, Transport and the Regions (Highways Agency) Institution of Civil Engineers Motor Industry Research Association National Fencing Training Authority Railtrack Royal Society for the Prevention of Accidents Transport Research Laboratory **UK Steel Association**

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Foreword

This part of PD 6634 has been prepared by Subcommittee B/509/1. The other parts in the series are:

- Part 1: Fundamentals Database;
- Part 2: Fundamentals of highway restraint systems;
- Part 4: Development of bridge parapets in the United Kingdom;
- Part 5: Development of barrier transitions and terminals;
- Part 6: Crashworthy roadside features Impact attenuators.

BSI committee B/509/1, whose constitution is shown in this Published Document, takes collective responsibility for its preparation under the authority of the Standards Committee. The committee wishes to acknowledge the personal contribution of Mr I B Laker.

Over the last 30 years the Department of the Environment, Transport and the Regions (DETR), the Transport Research Laboratory (TRL), British Standards Institution (BSI) and other organizations have been involved in research, testing, design and the preparation of specifications and standards for vehicle restraint systems such as safety fences, barriers and bridge parapets. Much of this work has been published in the form of Transport Research Laboratory reports, drawings, specifications and standards.

Over recent years, particularly since the introduction of quality assurance schemes for both the manufacture of components and the erection of safety fences and parapets, the need for additional advice, guidance and background information has been highlighted. In 1988 the then Department of Transport (DTp) and BSI agreed to the preparation of a comprehensive British Standard or reference manual on vehicle restraint systems.

A steering group of representatives from BSI, DTp and TRL was formed to supervise the project and the following terms of reference were formulated:

"To prepare the draft of a comprehensive document on safety fences, barriers and bridge parapets covering research and development, design, specification, manufacture, installation, repair and maintenance."

It was decided to split the reference manual into several parts and the following groups were formed:

— Working Group 1 — Part 1 dealing with the fundamentals of safety fences, barriers, parapets and transitions;

— Working Group 2 — Part 2 dealing with the specification and layout of safety fences and barriers;

— Working Group 3 — Part 3 dealing with the installation, inspection and repair of safety fences;

— Working Group 4 — Part 4 dealing with the installation, inspection and repair of safety barriers;

Working Group 5 — Part 5 dealing with all aspects of bridge parapets.

Of these proposed parts PD 6634 forms Part 1 and BS 7669-3 forms Part 3. Work on the other parts has been suspended.

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

This Published Document is not to be regarded as a British Standard.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 36, an inside back cover and a back cover.

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Introduction

In general, the safety barriers developed in the UK can be separated into those types constructed on discrete footings, referred to as post and rail barriers, and those mounted on a continuous footing, which are mostly manufactured from concrete, although barriers constructed of soil and other materials have been employed. Post and rail barriers are usually manufactured in steel, but wood, concrete and plastics materials have been used.

A further subdivision of safety barriers is made with respect to their containment qualities, or impact performance, against vehicles of various weights, speeds and approach angles. The containment classes referred to in the European Standard EN 1317-2 are listed as low, normal, higher and very high containment levels, irrespective of their manner of construction.

This part of PD 6634 deals with the development in the UK of both post and rail barriers, and barriers of continuous footing, over the range from low to very high containment levels.

Bridge parapets are discussed in Part 4 of this standard.

1 Scope

This part of PD 6634 describes the development of vehicle highway safety barriers in the United Kingdom. The term "safety barrier" includes those barriers installed on highways using discrete post footings (post and rail types) as well as those on continuous ground footings (concrete or soil). Barrier designs are described for the containment of vehicles ranging in mass from about 825 kg to 38 000 kg. Controlled tests are described for private car impacts at speeds up to 110 km/h (70 mile/h) and commercial vehicle impacts at speeds up to 80 km/h (50 mile/h).

2 Post and rail barriers

2.1 Post strength

The concepts of weak post and strong post highway safety barriers are discussed in PD 6634-2, **6.2**.

The leading wheels or bodywork of vehicles impacting weak post barriers are expected to make direct contact with the barrier posts. The design strength of the post is such that they collapse on impact in the longitudinal direction of the barrier; wheel snagging is avoided and so the unstable condition of vehicle spinout is unlikely to occur.

With strong post barriers, vehicle contact with the posts is prevented by mounting the beams, or horizontal rails, on a blocking-out piece fixed between the posts and rails. If mounted in soil, the posts tend to rotate at a rotational centre below ground level. Strong posts mounted in non-yielding footings, on impact, are designed to bend at ground level in a direction normal to the line of the barrier.

2.2 Elastic and plastic deformation

Figures 1 and 2 represent the stress loading across the section of a rectangular metal bar undergoing bending about its neutral axis.

The bar is assumed to be rectangular, of width W, and depth H; it experiences its maximum stress, in compression and tension, at distances $\pm h/2$ from the neutral axis. Figure 1 shows that under elastic loading the stress in the bar varies across its depth. In Figure 2 elastic loading is not considered, the beam experiences loading in the plastic region only, as indicated by the horizontal lines representing tension and compression.



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